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PRDA Test: Fluidized Bed Adsorption
McClellan Air Force Base, Site IC 31
Sacramento, California

Prepared for

McClellan Air Force Base
Sacramento, California
Contract No. F04699-97-C-0102

HLA Project No. 37478 43

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Technology Analysis Report
PRDA Test: Fluidized Bed Adsorption
McClellan Air Force Base, Site IC 31
Sacramento, California

HLA Project No. 37478 43

This document was prepared by Harding Lawson Associates (HLA) at the direction of the McClellan Air Force Base (McClellan AFB) for the sole use of McClellan AFB and the regulatory agencies overseeing the McClellan AFB Installation Restoration Program, the only intended beneficiaries of this work. No other party should rely on the information contained herein without the prior written consent of McClellan AFB and HLA. This report and the interpretations, conclusions, and recommendations contained within are based in part on information presented in other documents that are cited in the text and listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

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FIGURE

APPENDIXES

ACRONYMS

AEA	Atomic Energy Act
AFB	Air Force Base
ARARs	Applicable or Relevant and Appropriate Requirements
BAC	Bead Activated Carbon
BACT	Best Available Control Technology
BTEX	Benzene, Toluene, Ethyl Benzene, and Xylenes
CARB	California Air Resource Board
CCV	Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
CWA	Clean Water Act
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
DQO	Data Quality Objectives
DRE	Destruction and Removal Efficiency
EPA	Environmental Protection Agency
FBA	Fluidized Bed Adsorption
FWPCA	Federal Water Pollution Control Act
GC	Gas Chromatograph
GPM	Gallons Per Minute
GAC	Granular Activated Carbon
HASP	Health and Safety Plan
HCAS	Historical Cost Analysis System
IR	Installation Restoration
IRP	Installation Restoration Program
LCS	Laboratory Control Samples
MCL	Maximum Contaminant Level
MS/MSD	Matrix Spike/Matrix Spike Duplicates
NEPA	National Environmental Policy Act
NETTS	National Environmental Technology Test Sites
NMOCs	Non-methane Organic Compounds
NMHC	Nonmethane Hydrocarbon
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTL	National Test Location
OSHA	Occupational Safety and Health Act
OVM	Organic Vapor Monitor

ACRONYMS (CONT'D)

PCE	Perchloroethylene
PID	Photoionization Detector
POL	Petroleum, Oils, and Lubricants
ppmv	Parts Per Million by Volume
PRDA	Program Research and Development Announcement
PWS	Performance Work Statement
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RCRA	Resource Conservation and Recovery Act
RDC	Remote Data Collector
ROD	Record of Decision
SCFM	Standard Cubic Feet Per Minute
SCF	Standard Cubic Foot
SDWA	Safe Drinking Water Act
SERDP	Strategic Environmental Research and Development Program
SIC	Standard Industrial Classification
SOCs	Semi-Volatile Organic Compounds
SOP	Standard Operating Procedures
SVE	Soil Vapor Extraction
TCE	Trichloroethene
1,1,1-TCA	1,1,1 trichloroethane
TICs	Tentatively Identified Compounds
TPH	Total Petroleum Hydrocarbons
TPHe	Total Petroleum Hydrocarbons, Extractable
TPHd	Total Petroleum Hydrocarbons, Diesel Fuel
TPHg	Total Petroleum Hydrocarbons, Gasoline
TPHo	Total Petroleum Hydrocarbons, Motor oil
TPHp	Total Petroleum Hydrocarbons, Purgable
TSCA	Toxic Substances Control Act
TVH	Total Volatile Hydrocarbon Mass
VOCs	Volatile Organic Compounds
WIP	Final Work Implementation Plan

1.0 EXECUTIVE SUMMARY

1.1 Background

This Technical Analyses Report summarizes a Fluidized Bed Adsorption (FBA)[1] performance test conducted under a Program Research and Development Announcement (PRDA) at McClellan Air Force Base (McClellan AFB), Sacramento, California. This document presents the test objectives, test procedures, results, evaluation, conclusions, and recommendations.

The FBA process involves cycling adsorbent resin beads through two chambers: an adsorber and a desorber. In the adsorber, volatile organic compounds (VOCs) in the process gas are transferred onto the resin beads. In the desorber, the beads are heated to remove the adsorbed VOCs into nitrogen purge gas; the nitrogen is then chilled to condense the VOCs into a liquid condensate suitable for recycling.

FBA was identified as an innovative technology for testing at an existing soil vapor extraction (SVE) system at McClellan AFB Investigative Cluster 31 (IC 31; Appendix A - Plate 1); a mixture of petroleum hydrocarbons and chlorinated VOCs is present in soil at this site. The original intent of the demonstration was to collect performance data to document FBA costs and treatment capabilities. However, site conditions adversely impacted FBA operations, and the scope and objectives of the demonstration were modified to assess how the mixed organic waste stream would affect the performance of the adsorbent resin beads.

1.2 Demonstration Description

The FBA test was conducted on a nominal 100 standard cubic feet per minute (scfm) slip-stream from existing SVE well VW-5001. The FBA effluent vapors were subsequently processed by an existing catalytic oxidizer at IC 31 to provide a backup treatment process for air discharge compliance.

The demonstration was conducted in two phases: startup and test. During the startup phase, a sequence of diagnostic and mitigative actions were implemented by HLA to evaluate the impaired system operations. In the test phase, data were collected from the solid, liquid, and air process media to analyze how the mixture of petroleum hydrocarbons and chlorinated VOCs affected treatment performance relative to mass loading on the adsorbent resin beads.

1.3 Results

Field readings, chemical analysis results, and destruction and removal efficiency (DRE) calculations are summarized in tables, and laboratory reports are attached; chemical analysis results showed good correlation between the various methods used. Chemical analysis data from air, liquid condensate, and resin beads provide a basis for evaluating the relationship between treatment performance and the amount of residual organic mass adsorbed to the resin beads.

1.4 Conclusions

Treatment performance conclusions are as follows:

1. Without further development and testing, FBA technology is not appropriate for use at McClellan AFB sites where petroleum hydrocarbons are the primary constituents.

2. The FBA test unit achieved 91 percent DRE for TCE from air containing petroleum hydrocarbons that fall in the range of gasoline (C_5 to C_{12}) with a relatively small proportion (less than 3 percent) of chlorinated VOCs.

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[1] The term "Fluidized Bed Adsorption" has been used by the vendor for this equipment in trade literature; the reference to "fluidized bed" is intended to distinguish this technology from "static bed" adsorption technologies and is not intended to imply a certain particle path within the reactor.

3. Treatment performance of Ambersorb®600 deteriorates when residual mass loading on the resin exceeds 1,000 mg/kg total petroleum hydrocarbons as gasoline (TPHg).

4. The test indicated a desorber temperature of 425°F was sufficient to reduce the concentration of TPHg (including high-boiling compounds with carbon numbers as high as C_{13}) present on the resin beads; however, the resin beads do not have sufficient residence time within the desorber as presently configured to maintain a residual TPHg mass loading below 1,000 mg/kg. Residual TPHg concentrations below 1,000 mg/kg were achieved by additional desorption cycles without chemicals present in the influent air.

5. Bead cohesion was observed when the residual organic mass adsorbed to the resin contains less than 5 percent chlorinated VOCs, as well as when the residual mass on the resin exceeded 1,000 mg/kg TPHg.

6. FBA is more effective in treating TCE and PCE than lighter chlorinated VOCs, such as Freon 113 and 1,1,1-TCA. The differentiation is greater in the presence of petroleum hydrocarbons, which appear to preferentially adsorb to Ambersorb®600 relative to the lighter chlorinated VOCs.

7. The system effluent was relatively non-corrosive with test results yielding a design criterion for corrosion of 1 to 2 mils per year. The equipment fabrication design should include an additional stainless steel wall thickness of 20 mils to accommodate corrosion loss over 10 to 20 years of operation.

The FBA process efficiency conclusions are as follows:

1. The FBA demonstration recovered VOC contaminants as a recyclable product.

2. Increasing desorption time will reduce resin loading and likely enable sustainable operations to occur.

1.5 Recommendations

The following system enhancements are recommended:

1. Enlarge the desorber to maintain residual organic mass on the resin to less than 1,000 mg/kg TPHg by extending retention time in the desorber. A larger adsorption chamber would further improve the FBA test unit treatment performance by providing additional contact time between resin beads and the process gas stream.

2. Enlarge the adsorber to increase contact between the process gas and additional resin bead mass by extended retention time in the adsorber.

3. Evaluate the use of bead activated carbon (BAC) instead of Ambersorb®600 as the adsorbent material because in certain situations, BAC may provide an alternative adsorption medium that would not be susceptible to bead flow inconsistencies.

2.0 INTRODUCTION AND BACKGROUND

This Technical Analysis Report summarizes a Fluidized Bed Adsorption (FBA) performance test conducted under a Program Research and Development Announcement (PRDA) at McClellan Air Force Base (McClellan AFB), Sacramento, California. This document presents the test objectives, test procedures, results, evaluation, conclusions, and recommendations.

Fluidized Bed Adsorption (FBA) has been identified as an innovative technology that is applicable to the stated PRDA requirements for treatment of extracted soil vapor. Harding Lawson Associates (HLA) conducted performance testing of this technology using a slip stream from the existing soil vapor extraction (SVE) system at McClellan AFB Investigative Cluster 31 (IC 31; Appendix A - Plate 1). This site provided the opportunity for testing FBA performance at a site with diverse characteristics due to the presence of heavier petroleum hydrocarbons mixed with chlorinated volatile organic compounds (VOCs).

The purpose of this demonstration was to evaluate the ability of FBA to provide innovative and cost-effective remediation at sites contaminated with chlorinated VOCs. To perform the test at IC 31, HLA modified the FBA test unit to process a blend of fuel hydrocarbons (primarily branched alkanes), which have different adsorption/desorption characteristics than chlorinated VOCs such as trichloroethene (TCE). After the demonstration began, however, the physical properties of resin beads inside the FBA test unit changed and prevented sustained continuous operations. Total operation of the FBA test unit was limited to about 18 events, each with a duration of less than 20 hours. The project scope and objectives were modified to identify, assess, and evaluate system refinements that could address the operational difficulties and potentially facilitate sustained operations. The findings from this demonstration have resulted in FBA design improvements that facilitate continuous and cost-effective treatment applications for a variety of sites contaminated with mixtures of VOCs and petroleum hydrocarbons.

2.1 SERDP NETTS

The FBA technology demonstration was conducted under the National Environmental Technology Test Sites (NETTS) program. The demonstration was conducted at McClellan AFB Site IC 31,a Strategic Environmental Research and Development Program (SERDP) test location.

The NETTS has sponsored the development of five National Test Locations having established infrastructures and well-characterized contamination. McClellan AFB Site IC 31 was the National Test Location chosen as the site for the demonstration of FBA as documented in this report.

Congress established SERDP to improve cooperation among the U.S. Environmental Protection Agency (EPA) and the Department of Defense (DOD) armed services, and to use resources more effectively to develop technologies to clean up military sites containing residues. SERDP has funded the NETTS to facilitate the demonstration, evaluation, and commercial promotion of cost-effective, innovative environmental technologies.

2.2 Technology Objectives

The project objectives were developed to demonstrate the capabilities of fluidized bed adsorption to treat chlorinated VOCs. The objectives initially identified in the contract award documents focused on the treatment of chlorinated VOCs; during the planning and implementation of this demonstration, these objectives were refined to accommodate a more diverse chemical constituency as discussed below.

2.2.1 Planned Objectives

McClellan AFB and HLA developed three general objectives for the FBA test, as defined by the Performance Work Statement (PWS; *McClellan AFB 1996b*) for this PRDA contract. The Final Work Implementation Plan (WIP; *HLA 1997i*) outlined how the objectives would be measured and assessed during the demonstration:

- *Objective 1 - Demonstrate Innovativeness, Importance, and Relevancy.*

  Document the following operating parameters:

  - Non-corrosive emissions
  - Negligible NOx emissions
  - Product recycling rather than waste generation and disposal
  - Reduced energy use and input materials relative to comparable technologies.

- *Objective 2 - Evaluate Cost Effectiveness*

  Evaluate cost effectiveness of FBA for the full life-cycle of a soil vapor extraction project.

- *Objective 3 - Quantify Mass Removal*

  Demonstrate acceptable VOC mass removal capabilities during the test:

  - Best Available Control Technology (BACT) treatment criterion of 95 percent or greater destruction and removal efficiency (DRE) for mixed streams of chlorinated and nonchlorinated hydrocarbons
  - Ninety percent operational time after startup and shakedown
  - Satisfactory adsorption and desorption of high boiling point compounds with the recently modified hot-oil desorber.

2.2.2 Modified Objectives

During field implementation, the planned objectives were refocused and modified because the mixture of chlorinated VOCs and petroleum hydrocarbons in the process stream adversely impacted operations and prevented gathering information necessary to satisfy the original objectives. HLA developed a plan with McClellan AFB to evaluate how the performance of the resin beads, Ambersorb®600, is affected as the mass of petroleum hydrocarbon constituents adsorbing to the resin accumulates. The modified scope provides for a more detailed perspective of Objective No. 3 (Quantify Mass Removal) :

- *Objective 3A - Quantify Mass Removal Performance of Ambersorb®600*

  - Assess impacts from branched alkanes to resin physical and chemical characteristics.
  - Monitor treatment efficiency relative to residual hydrocarbon loading on the resin.
  - Identify system FBA system enhancements to facilitate continuous treatment operations.

This information is valuable because Ambersorb®600 is one of several adsorptive resin materials being introduced as a critical operating component of many recently developed remediation technologies. As a result, findings from the test are pertinent to a wide range of potential Ambersorb®600 applications and also help identify design modifications to optimize performance of the FBA system.

2.3 Technology Overview

The fluidized bed adsorption process is designed to capture and recover a wide variety of VOCs commonly found at industrial and military sites. Initially, this technology was applied to industrial processes such as solvent recovery applications. It was further developed for use in the site remediation field and has been successfully applied at sites contaminated with chlorinated VOCs, primarily trichloroethene (TCE). This demonstration advances the

technology to address several additional challenges associated with variability in the mixture, type, and concentration of VOCs present in extracted soil vapor. Design modifications have been identified for applying this technology at sites exhibiting mixtures of petroleum hydrocarbons and chlorinated VOCs.

2.3.1 Technology Applicability

FBA is suitable for capture and recovery of a wide variety of chlorinated and nonchlorinated VOCs. The FBA desorber and chillier design temperatures determine the range of VOCs that can be treated. Relatively volatile compounds, such as solvents, are the most applicable targets for FBA because the resin beads can be regenerated at relatively low temperatures with corresponding low energy needs. The following compounds are typically treatable with FBA using the original steam-heated desorber operating at 300° F:

Perchlorothylene (PCE)	Chlorobenzene
Trichloroethene (TCE)	Dichlorobenzene
Methyl ethyl ketone (MEK)	Benzene
Methylene chloride	Ethylbenzene
Carbon tetrachloride	Toluene
1,1,1-trichloroethane (1,1,1-TCA)	Xylenes (o-, m-, and p-)
Acetone	Freon® 113
Chloroform	

The FBA test unit was modified for the IC 31 test to use an oil-heated desorber operating at a maximum temperature of 450°F. This experimental modification was made to improve the FBA test unit's ability to desorb semivolatile organic compounds (SOCs) that have boiling points higher than 300°F, generally those petroleum hydrocarbons with carbon numbers equal or greater than C_{10} (decane).

2.3.2 Technology Advantages

The fluidized bed process offers a number of advantages over other available, leading treatment technologies. FBA does not destroy the solvents, but recovers them so that they can be recycled. Relative to fixed bed regeneration systems, the fluid-bed adsorber has less pressure drop through the adsorbent and, therefore requires less energy to move the organic vapors through the system. Additionally, less energy is used in the regeneration process in that the desorber remains heated at the desorbing temperature via a recirculating hot oil system or steam generator. Because the desorber remains at a constant temperature, extra energy is not expended heating and cooling the entire desorber vessel as with fixed-bed systems. In the fluid-bed system, only the adsorbent medium cycles thermally as it moves from the desorber to the adsorber and back again. This lack of thermal cycling of the desorber vessel also reduces the potential from metal stress and fatigue which can lead to favored sites for corrosion attacks. Lower pressure drop in the adsorber and lack of thermal cycling in the desorber translate to lower operating costs and better corrosion resistance. Finally, because a condensation process rather than an oxidation process is used to remove the VOCs from the purge gas, corrosive oxidation byproducts are insignificant and NOx and SOx are not emitted.

2.3.3 Technology Limitations

FBA technology relies on adsorptive media to capture VOCs from the vapor stream and then release the VOCs for desorption. In addition, the media must have structural integrity to tolerate extended exposure to turbulent vapor streams. Granular activated carbon (GAC) is commonly used for many adsorptive media purposes; however, GAC must go through a heating process to harden the material for sale as bead activated carbon (BAC). Manufactured resin materials, such as Ambersorb 600, are physically durable beads that have different adsorptive characteristics

than BAC relative to various chlorinated VOCs and petroleum hydrocarbons. Ambersorb 600 was selected for this demonstration because it is a readily available product, whereas BAC has less reliable sources.

Temperature settings in the desorber and solvent condensers are selected on the basis of the types of VOCs present in the process stream. Three classes of compounds cause potential difficulties with the treatment process: high boilers, low boilers, and compounds with high freezing points. FBA design temperature settings need to be modified to address these compounds.

- ***High boilers*** are compounds with boiling points at or above the temperature of the FBA desorber where VOCs are evaporated into vapor phase from the loaded beads. These compounds remain adsorbed to adsorbent medium indefinitely and, as the resin continues to cycle through contaminated SVE stream, accumulate on the adsorbent medium. Such compounds ultimately saturate the adsorption sites on the medium, resulting in decreased removal efficiencies for all VOCs being treated. Steam-heated desorbers are impacted by compounds that boil at more than 300°F, such as decane. Oil-heated desorbers achieve higher temperatures (up to 425°F) and can accept a wider range of high-boiling VOCs. The current demonstration was impeded by the presence of high boilers and, as a result, further design modifications have been identified.

- ***Low boilers*** are compounds with boiling points at or below the temperature of the FBA condensers where the vapor-phase VOCs are condensed into liquid phase. These compounds, such as chloromethane, if not condensed, are returned to the FBA adsorber with nitrogen offgas and are emitted to the atmosphere rather than recovered as liquid product. This condition results in lower capture efficiency for low boilers compared to less volatile compounds.

- ***High freezers*** are compounds that exhibit freezing points above the temperature of the FBA condenser where vapor-phase VOCs are condensed to liquid-phase product. These compounds freeze into solid-phase and can clog the condenser. During previous testing, xylene was the primary chemical that caused clogging (*Paragon, 1995*).

The potential difficulties associated with low boilers and high freezers are addressed using a two-stage condenser design, which allows high freezers to be condensed and separated as liquid before the low boilers are condensed into a liquid-phase at a lower temperature.

In addition to these classes of compounds, chlorinated organics can break down during desorption and form acid gases due to uneven heat transfer. When electrical heaters are used to regenerate adsorption beads, very large thermal gradients are generated at the surface of the electric heaters. In the presence of oxygen, this hot spot may cause degradation of the chlorinated compounds and generate acid gases. Solvent degradation is minimized by using evenly distributed heat sources, such as steam or hot oil, and an inert purge gas, such as nitrogen.

2.3.4 Development Status

To our knowledge, HLA operated the first field-scale FBAS on a SVE application in the United States. The system was operated at the National Semiconductor Corporation (National) facility in Santa Clara, California. The successful extended pilot study treated an SVE offgas stream containing a mixture of chlorinated and nonchlorinated VOCs (*Paragon, 1995*). Two full-scale treatment systems have subsequently been constructed and are in operation at the site.

Pilot test results indicate that the unit achieved a total nonmethane hydrocarbon (NMHC) removal efficiency of 86 to 95.9 percent. The inlet stream consisted of 100 standard cubic feet per minute (scfm) air with a mixture of xylenes, ethylbenzene, TCE, perchloroethylene (PCE), Freon® 113, acetone, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichlorobenzene, and 1,1,1-TCA. Purge gas was supplied from an in-house nitrogen supply. Condensers were operated using an in-house chilled water source. Desorption heat was supplied by a steam generator.

At test site IC 31, chlorinated VOCs are mixed with fuel constituents, including branched alkanes with boiling points that exceed the 300°F desorption temperature achieved by the original FBA system using low-pressure

steam for a heat source. To proceed with the test, HLA rebuilt the FBA test unit to incorporate a 425°F hot-oil desorber to treat high-boiling hydrocarbons and a second-stage chillier to treat low boilers and high freezers. Conditions at IC 31 provided data on FBA operations where a significant portion of the influent stream consisted of high-boiler fuel constituents, as would be characteristic of remediation projects at many other facilities.

2.4 Demonstration Scope

FBA testing was conducted on a slip stream (90 to 110 cfm) from the existing SVE system at Site IC 31. The Process Flow Diagram (Plate 2) illustrates the incorporation of the FBA test unit into the existing SVE system. HLA provided the FBA test unit and an auxiliary positive displacement (PD) blower.

Three contracting and planning documents defined the scope of the FBA demonstration:

- *Program Research and Development Announcement Proposal* (PRDA Proposal; *HLA, 1996*) presented a proposed scope of work.
- *Performance Work Statement* (PWS; *McClellan AFB, 1996b*) issued by McClellan AFB, defines the contracted scope of work.
- *Final Work Implementation Plan* (WIP; *HLA, 1997i*) defined the demonstration objectives and developed a detailed scope of activities to evaluate FBA performance. The WIP is structured in accordance with the outline template for all NETTS (*McClellan AFB, 1997a*) and presents the implementation plan for the FBA Test. In addition, the WIP includes the following sections and support documentation required by Contract No. F04699-97-C-0102:
  - A summary of how monitoring data were to be evaluated to assess performance versus objectives (Section 4.4[of the WIP])
  - A description of field activities (Sections 5.0 and 7.0). Field work would be performed in accordance with the Quality Assurance Project Plan (Section 8.0 and Appendix B) and cross-referenced with NETTS format in Section 9.0.
  - A Site-Specific Health and Safety Plan (HASP), prepared in accordance with OSHA Publication 1910.120; AFOSH Publication 161-21; and U.S. Army Corps of Engineers Safety and Health Requirements Manual EM-385-1-1 (Section 9.0 and Appendix B)
  - A Hazardous Waste Management Plan (Section 5.4)
  - A Sampling and Analyses Plan (Section 7.0)
  - A Quality Assurance Project Plan (Section 8.0).

The demonstration scope was adjusted in response to field observations during startup operations to assess the cause of disrupted bead flow. The modified scope involved an iterative sequence of trouble-shooting activities that involved isolating parameters affecting system performance for more focused evaluation. As a result, the startup phase (Section 4.3.1) was extended to about 8 weeks from the original plan of 5 days. The test phase (Section 4.3.2) was changed to a short-term demonstration evaluating differential loading on the resin beads over time. HLA coordinated the scope modifications with McClellan AFB as defined by the following three documents:

- *Field Demonstration Termination Proposal* (Letter, HLA, *1997m*), attached in Appendix F, proposed scope of work modifications to facilitate completion of the PRDA demonstration recognizing the operation limitations encountered during field testing at IC 31.
- *Supporting Cost Information* (Letter, HLA, *1997n*) provided a detailed assessment of costs adjustments associated with the modified scope.

- *Modification of Contract F046997C0102* (Memorandum & Contract Document, *McClellan AFB, 1997b*) provided contractual adjustments to implement the modified scope of work.

2.5 Document Organization

This report is organized according to a format similar to that of the EPA's Site Program Application Analysis Report. Each section is described below. Sections marked with an asterisk are additions to the format of the EPA report.

- Section 1.0 **Executive Summary**, summarizes the demonstration results and conclusions.
- Section 2.0 **Introduction**, concentrates on the demonstration objectives and scope.
- Section 3.0 **Site Description**, with site characterization data.
- Section 4.0 **Demonstration Description**, describes the technology, installation, operation and sampling strategy used to characterize the relative success of the demonstration.
- Section 5.0 **Technology Performance Evaluation**, details the numeric success of the demonstration in terms of remediation effectiveness and system performance.
- Section 6.0 **Other Technology Issues**, including regulatory, health and safety, and community acceptance issues.
- Section 7.0 **Cost Evaluation**, describes the unit-costs for FBA technology.
- Section 8.0 **Conclusions**, describes performance issues relating to the treatment of mixed waste streams, cost issues and technology limitations.
- Section 9.0 **Recommendations**, describes possible process improvements for future applications.

3.0 SITE DESCRIPTION

3.1 Location and Setting

McClellan AFB selected Site IC 31 to test FBA. McClellan AFB operates a catalytic oxidizer (cat-ox) at the site that treats vapor phase contaminants from the following sources:

- Vadose zone soil vapors from extraction well VW-5001
- Air emissions from an air stripper treating extracted groundwater at the site.

McClellan AFB constructed a concrete pad to accommodate technology demonstration projects. The test equipment pad is adjacent to the SVE, cat-ox, and groundwater treatment equipment with power, tap water, and McClellan AFB sewer connections available.

3.2 Geology

Reserved (No pertinent information is available under this heading).

3.3 Hydrogeology

Reserved.

3.4 Contaminant Distribution

Table 1 summarizes the chemicals of concern observed in vapors from VW-5001 and the air stripper at Site IC 31 based on a review of data provided by McClellan AFB (Appendix A). Both sources exhibited a mixture of chlorinated and nonchlorinated hydrocarbons in extracted vapor. VW-5001 was selected as the sole source of VOCs for demonstrating FBA performance because it exhibited higher VOC concentrations and a much lower water content.

The chlorinated VOCs, typically related to solvent releases, include TCE; 1,1-dichloroethene (1,1-DCE); 1,1,1-TCA; carbon tetrachloride, and Freon® 113. These chlorinated VOCs are highly volatile under ambient conditions and are readily recovered by SVE. TCE concentrations at extraction well VW-5001 decreased from a maximum concentration of 1,500 parts per million by volume (ppmv) to 70 ppmv during the fourth quarter of 1996. TCE is typically observed at concentrations an order of magnitude greater than the other chlorinated VOCs; 1,1-DCE provides the second-most significant mass contribution.

The petroleum VOCs are a mixture of straight-chain hydrocarbons (alkanes), methyl and ethyl groups attached to alkanes (branched alkanes), and aromatic hydrocarbons such as benzene, toluene, ethyl benzene, and xylenes (BTEX). Site data provided by McClellan AFB included an estimate of the total mass of hydrocarbons in VW-5001 vapors (October 28, 1996) expressed as 3,258 ppmv Total Volatile Hydrocarbon Mass (TVH); results for individual analytes showed 1,500 ppmv TCE in the same sample. A review of the available TVH mass calculations indicated that more than half of the hydrocarbon constituents entering the cat-ox system fell in the gas chromatograph (GC) range of pentane to octane (C_5 to C_8); lighter hydrocarbons (propane and butane, C_3 to C_4), and semivolatile hydrocarbons (decane and above, C_{10}+) were observed at concentrations that were generally an order of magnitude lower than the C_5 to C_8 range.

4.0 DEMONSTRATION DESCRIPTION

4.1 Technology Principles

FBA technology concentrates VOCs from vapor-phase constituents in air streams into liquid-phase product. The process uses an adsorptive medium to remove VOCs from the air stream, continuously regenerates the adsorptive medium with heat, and recovers the VOCs as a liquid-phase product typically suitable for recycling.

The main components of an FBA system include:

- Fluidized bed adsorber
- Moving bed desorber with a heat source
- Adsorbent beads (made from either carbonaceous resin or bead activated carbon)
- Solvent condenser with liquid-chillier refrigeration.

An FBA system is coupled with a vacuum blower and moisture separator to comprise a complete SVE system with offgas treatment, as shown on the process flow diagram (Appendix A, Plate 2). For the demonstration at IC 31, the FBA test unit treated a 100-cfm slip stream of soil vapors from SVE well VW-5001. The adsorbent material (carbonaceous resin beads) used for this demonstration was Ambersorb® 600, manufactured by Rohm and Haas Company (Rohm & Haas). The beads cycle between the adsorber and desorber in a continuos regeneration process; the FBA test unit used for this demonstration had a complete bead cycle of about 135 minutes.

4.1.1 Adsorption Column

The air stream containing solvent vapors is treated continuously through the FBA column (adsorber). In the adsorber, the solvent vapors are removed from the process gas by adsorption onto the solid resin beads that flow across a series of perforated trays in the adsorber tower. The air stream travels upward through the adsorber tower and passes through several trays of adsorbent medium. Regenerated adsorbent is continuously loaded at the top of the tower and travels downward through a series of "downcomers." The arrangement is similar to that used in air strippers and distillation towers. The adsorbent medium acts like a liquid (hence the term "fluidized") because of the lifting action of the air stream traveling upward through the perforations in the trays. The adsorbent becomes progressively more loaded with VOCs as it travels down the tower; when it reaches the bottom of the tower, it is removed for regeneration.

4.1.2 Desorption Column

The resin with adsorbed VOCs (loaded beads) is transported from the bottom of the adsorber to the top of the moving bed desorption column (desorber) by pneumatic lift. The desorber regenerates the resin by heating it with a non-contact steam or recirculating hot oil; the equipment used for this demonstration was modified to use hot oil at a temperature of 425° F to treat the branched alkanes observed at IC 31. Heat causes the VOCs on the loaded beads to return to the vapor phase where they are removed from the top of the desorber by a small, constant stream of purge gas (nitrogen) injected at the bottom of the desorber. Before it leaves the desorber, the resin is cooled to near ambient temperature by a non-contact cooling water stream. The regenerated beads are then returned to the top of the adsorber.

4.1.3 Product Condensation

The hot stream of purge gas, which has a high concentration of VOCs, is transported to a two-stage solvent condenser. In the first stage of the condenser, a high temperature coolant or cooling water is used to condense high boiling point liquid solvents (e.g., xylenes), which could freeze in the second, refrigerated condenser. In the second stage condenser, the low boiling point liquid solvents are condensed. The discharge from both stages of

condenser is directed to a solvent recovery drum. The remaining carrier gas is recycled back into the adsorber where any remaining solvent is processed through the adsorber.

4.1.4 Product Recycling

Recovered liquid product is contained in DOT-approved drums for transportation to a licensed recycling facility. The product becomes the property of the recycling facility, which recovers the various constituents as a recycled solvent or blends the product into heating fuel for cement kiln furnaces.

4.2 Treatment System Installation and Operation

The FBA test unit installation is diagrammed in the following design drawings originally included in the final WIP (*HLA, 1997i*), attached in Appendix A:

- Process Flow Diagram (Plate 2)
- Instrumentation Diagram (Plate 3)
- FBA Test Layout Diagram (Plate 4)
- One-Line Diagram (Plate 5)

After the McClellan AFB field kick-off meeting on June 20, 1997, FBA system installation began on July 1, 1998. The following major equipment components were delivered and installed at IC 31:

- FBA Test Unit skid with control panel, adsorber, desorber, and condensers
- PD blower trailer with moisture separator
- Condensate collections drums with secondary containment
- Liquid nitrogen tank with an evaporator and pressure regulator.

Three-inch-diameter PVC piping was attached to flanges on the existing SVE system and extended to the FBA test unit; due to temperatures in excess of 130° F, galvanized steel pipe was used between the blower and the heat exchanger. A positive displacement blower equipped with a 15-horsepower electric motor was installed to pull a slip stream of 100 cubic feet per minute (cfm) from well VW-5001 through the FBA Test Unit and then back into the SVE system upstream of the catalytic oxidizer. The FBA Test Unit was loaded with approximately 90 pounds of Ambersorb®600 carbonaceous adsorbent. The 500-gallon nitrogen tank was placed on the test pad to provide a noncombustible purge gas in the desorber.

Supply water, used for non-contact cooling at a rate of 2 gallons per minute (gpm), was connected to the FBA Test Unit with flexible hose. The moisture knockout vessel and condensate collection drums were installed within secondary containment having a minimum capacity of 110 percent of the primary containment vessels.

Demonstration operations are chronicled in Section 4.3. During operations, the system performance was adjusted by varying the following process parameters:

- Process gas flow rate through the adsorber
- Process gas inlet temperature
- Influent VOC concentrations, adjusted with dilution air
- Adsorbent transfer rate between adsorber and desorber

- Desorber retention time
- Desorber set point temperature
- Condenser set point temperature
- Coolant water flow rate
- Nitrogen purge gas flow rate.

4.2.1 Well Installation, Drilling, and Sampling

Reserved.

4.2.2 Monitoring System

System operations monitoring was conducted using control switches and alarm shutoffs as described in Section 4.2.3. System performance was monitored with a sampling program as discussed in Section 4.4.

4.2.3 Instrumentation and Control

Instrumentation was installed to shut down the FBA test unit concurrently with any shutdown of the existing cat-ox downstream of the FBA test unit. In addition, shutdown controls were connected to high-level switches in the moisture knock-out vessel, solvent recovery drums, and the secondary containment. Internal controls shut down the system for a low bead level in the desorber, low nitrogen flow to the desorber, or if the hot oil pump were to shut down. An autodialer was connected to the shutdown instrumentation to notify HLA maintenance personnel of a system shutdown via telephone.

4.3 The Two Phases of the Technology Demonstration

The FBA demonstration was conducted in two phases: startup and test. The purpose of the startup phase was to adjust the FBA test unit operating parameters to stabilize system operations and optimize DRE. When bead flow problems were observed, the startup phase was extended to isolate factors affecting system operations for more detailed evaluation. The test phase was modified to focus on resin performance during a short duration test in order to access the physical and adsorption behavior as the result of branched alkane accumulations on the beads. A summary of field notes is presented in Table 1.

4.3.1 Startup Phase

This section provides a general chronology of startup-phase activities between July and September 1997.

Initial Settings

On July 15, 1997, HLA initiated FBA system startup with a series of instrumentation checks and adjustments. Ambient air was used initially as the process gas to check system operations by opening the blower inlet to the atmosphere via the dilution air valve. The process gas flow rate was controlled by varying the speed of the auxiliary PD blower and by adjusting the control valve on the process gas stream inlet. The desorber temperature was initially set at 375° F by adjusting the built-in controls in the hot-oil heater. The primary liquid chillier was set at about 30°F to condense compounds like xylene that could freeze; the secondary liquid chillier was set at about -30° F to recover the lighter-end VOCs that were not condensed in the primary chillier. The flow rate for nitrogen purge gas entering the desorber was set at 1.5 scfm using a control valve on the rotameter. The transfer rate of the adsorbent beads was adjusted with built-in ball valves controlling both the air flow and the bead flow rate from the lifter blower entering the adsorbent transport lines. Field measurements were collected throughout startup operations, recording flow rates, temperatures, and equipment operating time.

After setting the operating parameters while processing ambient air, the blower inlet was reconfigured to accept air from VW-5001. Influent VOC concentrations in process gas were varied by adjusting the dilution air valve and Day 1 samples were collected for chemical analyses as discussed in Section 4.4.

Inconsistent Bead Flow

Once the FBA test unit was introduced to well air on July 17, inconsistent bead flow inside the unit disrupted operations within 24 hours after well air was introduced as the process gas. Beads flowing between the adsorber and desorber would occasionally cohere loosely and impede bead circulation, which normally completes a full cycle in approximately 2 hours. The bead flow would back up inside the FBA test unit, causing decreased removal efficiencies and system shutdowns. Most occurrences involved beads backing up inside the adsorber, and an automatic shutdown would occur because a low bead level would be detected inside the desorber. On some occasions, the beads would back up inside the desorber, so that beads transferring from the adsorber to the desorber would be detoured back to the adsorber via an overflow line. As a result, a fixed amount of resin beads would continually circulate through the adsorber without being desorbed; HLA's field technician would manually shut down the system when this condition was observed. After each shutdown, the field technician would physically dislodge the bead backup and restart the system using ambient air before reintroducing well air.

HLA initiated several activities to evaluate the situation, identify the specific cause of the problem, and implement field modifications as warranted. Throughout this iterative process, HLA provided status updates to McClellan AFB (*HLA, 1997 a,e,g,j,k),* identified corrective measures (*HLA, 1997 b,l*), and initiated correspondence to modify the PWS (*HLA, 1997 c, f,m,n*) (*McClellan AFB, 1996 b, 1997 b, c*), as necessary. As a result, diagnostic activities and corrective measures beyond the scope of activities described in the WIP were implemented.

Relative Humidity

From July 18 through August 5, corrective measures focused on water condensation that might cause the beads to bind loosely with surficial moisture. Although the resin beads (Ambersorb®600) are hydrophobic and therefore unlikely to accumulate water condensate, the process stream involves a number of temperature and pressure changes that cause fluctuations in relative humidity. In addition, other IC 31 operations were concurrently impacted by excessive water condensate accumulations on July 24. Therefore, HLA systematically implemented actions to establish that water condensate was not inhibiting bead flow.

Because relative humidity is severely impacted by temperature fluctuations, HLA assessed the impacts of ambient temperatures at IC 31; temperatures varied from over 100° F during the afternoon to mid-50s during the predawn hours. Substantial amounts of water condensate collected in the influent piping during the morning hours. This situation was further aggravated by the air-to-air heat exchanger downstream of the blower that cooled the influent vapors before they entered the FBA. HLA installed a secondary moisture knockout drum between the heat exchanger and the FBA to precipitate water condensation directly upstream from the FBA test unit inlet. In addition, HLA installed a timer to turn off the heat exchanger at night to reduce condensation from cooling. Bypass piping was installed to completely eliminate the heat exchanger and further reduce temperature drops that caused condensation before soil vapors entered the FBA.

Unusually high water accumulations were responsible for shutting down the catalytic oxidizer, and in turn, the FBA test unit on July 24, 1997. Field observations indicated that the air stripper effluent was contributing vapors to the slip-stream feeding the FBA test unit. At HLA's request, McClellan AFB fully isolated the flow from VW-5001 to check that air-stripper offgas (heavily laden with water) was not contributing condensate to the FBA influent. A new bead flow control valve was installed on the desorber bead drain to make sure it was not restricting in the bead circulation between desorber and adsorber.

After implementing these system modifications, HLA measured relative humidity during peak high and low ambient temperatures at the following locations: blower influent and effluent, knockout effluent, and FBA influent. The relative humidity readings were used for reconfiguring the heat exchanger and moisture knockout capabilities upstream of the FBA test unit to minimize condensation in the adsorber by maintaining the relative humidity below the saturation point.

"Day 5" startup samples, as defined in the WIP, were collected for analysis on August 8 and the results were used to further evaluate the situation. After receiving the Day 5 lab results, HLA expanded the focus of the performance investigations to consider other potential impacts to bead flow, such as hydrocarbon accumulations on the beads that caused cohesive attraction. In an August 19 facsimile, HLA provided McClellan AFB with preliminary chemical analysis results for resin and air samples. The situation was discussed with McClellan AFB technical staff on August 20, resulting in the implementation of several action items, including the pursuit of more technical support from Rohm & Haas, the manufacturer of Ambersorb®600.

Manufacturer Consultations

Throughout August and September 1997, HLA engaged Rohm & Haas technical staff in discussions regarding the performance of the Ambersorb®600 beads. Rohm & Haas was provided with field data including relative humidity readings, chemical analysis results, and system configuration. Rohm & Haas provided HLA with quality control data on the batch of Ambersorb®600 and confirmed that the material was new. Isotherms were provided regarding TCE adsorption showing the resin was performing within the established specifications (see Section 5.0). HLA implemented three Rohm & Haas recommendations:

1. Reduce excessive water from the influent vapors.

2. Maximize the nitrogen purge gas flow rate at 2.5 scfm to improve the kinetics for transferring VOCs from the resin beads in the desorber.

3. Conduct inorganic analyses to evaluate whether rust from the adsorber was accumulating on the resin and fouling its adsorptive characteristics.

Internal Physical Inspection

On September 25, HLA physically inspected each tray of the adsorber to check that no physical restrictions were obstructing bead flow. The inspections was conducted by drilling holes in the side wall between each tray and inserting a camera probe (Olympus Bore Scope) to view the bead flow path. The sidewall access holes were subsequently plugged with threaded screws.

4.3.2 Test Phase

The test-phase monitoring program was modified to evaluate how Ambersorb®600 performs with relatively low residual hydrocarbon mass after an extended desorption process. This section provides a general chronology of test phase activities conducted on December 3, 1997:

Initial Desorption

The FBA system was operated using ambient influent air to remove VOCs from the resin to the greatest extent possible. The existing load of resin was circulated through the FBA system for 17.5 hours (approximately 8 complete internal bead circulation cycles) to increase residence time in the desorber to assess whether increased desorption time resulted in the removal of residual chemical mass affecting bead performance. Because no source of VOCs was connected, VOCs were not accumulating on the resin as the beads circulated through the adsorber during this exercise. HLA collected resin samples from both the adsorber and desorber to determine baseline VOC loading on the resin after performing this extended desorption process.

VOC Accumulation Monitoring

Soil vapors were introduced into the FBA influent to monitor resin loading as the beads circulated through the FBA to observe how various constituents accumulate on the resin as the beads continued to circulate. Air samples were collected from the influent and effluent to monitor removal performance as constituents accumulated on the beads. After 2 hours of operation (slightly less than the duration of the 2.2-hour bead cycle), the FBA system shut down due to bead flow restrictions and HLA observed that bead flow was disrupted at the top of the adsorber. Resin bead samples were collected from the adsorber and desorber after the FBA stopped operating.

Discontinued Bead Flow

HLA observed increasingly strong and pervasive bead cohesion that discontinued bead flow throughout the FBA test unit at the conclusion of the test phase demonstration. The beads began to stop moving in random "fluidized" patterns, but instead formed a honey-comb network that allowed process gas to continue to flow through the pores as the beads stabilized. A 1/8-inch-diameter steel bar was used to probe and dislodge the beads backed up inside the adsorber. The beads did not readily dislodge as they were removed from the adsorber, which is consistent with a general trend of stronger cohesion throughout the test operations.

Final Desorption

Between December 11 to 13, 1997, HLA restarted the system processing ambient air to desorb hydrocarbons from the resin bead as thoroughly as possible prior to closing out the test. The beads were circulated approximately 8 hours or three complete bead cycles.

4.4 Sampling Strategy and QA/QC Results

The sampling schedule summarizing sampling parameters, frequencies, and test methods for the FBA Test is discussed in this section and presented on the Sampling Schedule, Table 2. Standard Operating Procedures (SOPs) for all of the chemical analyses methods referenced in this section were provided in the WIP Appendix C (*HLA, 1997i*). Chemical analysis results were validated in accordance with the QAPP presented in WIP Section 8.0. The following tables were presented in the WIP to support the sampling plan and are attached for reference in Appendix A:

WIP Table 5 - Sampling Container Types and Holding Times

WIP Table 6 - Rationale for Vapor and Emission Sampling[2]

WIP Table 7 - Analytical Data Quality Objectives.

4.4.1 Pre-Demonstration Sampling

Pre-demonstration sampling was conducted at the beginning of the startup phase to document baseline conditions and check the functionality of the FBA test unit before proceeding with the test phase.

4.4.1.1 Resin Baseline and Startup

The objective of resin baseline sampling was to establish the initial condition of the virgin Ambersorb®600. Startup resin samples were collected in accordance with the Day 1 and Day 5 startup sampling event defined in the final WIP (*HLA, 1997i*) to assess mass loading on the resin resulting from startup operations.

After breaking the seals on the buckets of new resin beads, samples of virgin Ambersorb®600 were collected in an 8-ounce glass jar and analyzed for baseline concentrations of VOCs, as defined by the Day 1 startup sampling event in the WIP (*HLA, 1997i*). Total petroleum hydrocarbons using purging recovery methods (TPHp, EPA Test Method 5030) and TPH using extraction recovery methods (TPHe, EPA Test Method 3550) were quantified with modified EPA Test Method 8015 (modified EPA 8015) using gasoline, diesel fuel, and motor oil standards (TPHg, TPHd, and TPHo). VOCs were analyzed using EPA Test Method 8240 (EPA 8420).

No quality control sampling was conducted for the pre-operational adsorbent sampling. Because virgin resin beads were provided, chemical analysis was not likely to find chemicals present above detectable concentrations so additional QC analyses was determined to not be necessary. Chemical results was validated in accordance with the WIP Quality Assurance and Project Plan (QAPP, WIP Section 8.0).

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[2] Defines the quality of data measurements as "definitive" or "screening" quality.

4.4.1.2 System Startup and Optimization

During field operations, HLA recorded pressure, flow, and temperature readings in a field log several times daily. Flow rate data were recorded, as measured by a Preso venturi flow meter (venturi) installed downstream of the adsorption tower. A magnehelic gauge connected to the venturi metering taps was used to measure the pressure differential across the venturi in inches of water column (in. H_2O). The pressure differential across the venturi, the soil vapor temperature, and the line pressure upstream of the venturi were used to calculate the system flow rate in scfm. Pressure and temperature values of 14.7 psia and 60°F, respectively, was used to convert to standard flow conditions.

Vapor Sampling

After the new beads were place in the FBA test unit, vapor sampling was conducted to obtain instantaneous screening-level data and to observe how various parameters affect system performance and then adjust the settings as needed, as discussed in Section 4.3.1. Startup sampling also provided process stream influent and effluent concentrations at the start of the test, before a substantial mass of constituents could accumulate on the resin beads.

Vapor concentrations were measured using the three methods described below. "Definitive" results, as defined by the WIP (*HLA, 1997i*), are based on the most reliable sampling and analytical techniques and supersede the quality of other measurements. "Screening" results are used for more instantaneous monitoring purposes:

1. Definitive VOC concentrations were measured by collecting vapor samples in SUMMA® canisters for analysis using TO-14. Vapor samples were collected using the laboratory-supplied stainless steel flow controller and fittings. A 1/4-inch inert tubing equipped with a barbed, quick-disconnect, male fitting was attached to the sampling canister using a ferrule nut. The SUMMA® canister was then attached via the inert tubing to a female, quick-disconnect fitting installed at the sampling location. Once the SUMMA® canister was connected, the valve in the flow controller was fully opened and process air allowed to enter the canister. After one minute, the flow controller valve was closed and the hose disconnected. A dedicated quick-disconnect fitting and sampling tube was used for each sampling location. SUMMA® canisters were transported under chain of custody to a state-certified laboratory for analysis.

2. Screening-quality VOC concentrations were measured by collecting vapor samples in 1-liter Tedlar® bags for analysis using EPA Test Method 8021 (EPA 8021) and Test Method E18 (E18). The Tedlar® bag samples were collected from the sampling ports using Teflon® or other inert tubing. Because the vapor in the process stream was under pressure, a vacuum box was not needed to fill the bag. Each sample location had dedicated tubing to prevent cross contamination. The tubing had split connections to facilitate simultaneous collection of duplicate samples. Tedlar® bag samples collected for laboratory analysis were stored out of sunlight to prevent photochemical reactions and transported under chain of custody to an onsite laboratory.

3. Additional screening-quality data were collected using PID measurements to quantify VOC concentrations during the startup phase because they provide instantaneous results that can be used to monitor the effects of adjusting multiple process parameters. Vapor VOC concentrations were measured in the field using a Photovac Microtip® HL 2000 PID equipped with a 10.6 electron-volt (eV) ultraviolet lamp or aThermo Environmental Instruments, Inc. organic vapor monitor (OVM) Model 580B equipped with a 10.0 eV lamp. Before each system monitoring event (i.e., daily), the PID was calibrated per manufacture's instructions using a 100 ppmv isobutylene gas standard.

Vapor samples were collected during the startup phase in accordance with the Startup Sampling Schedule (WIP Table 1) for Day 1 and Day 5, respectively. On July 17, 1997, the first day of startup (Day 1), an initial influent vapor sample was collected in a Tedlar® bag for analysis by EPA 8021 and E18 to establish initial conditions. VOC concentrations continued to be monitored with a PID to provide immediate readings. When FBA startup operations were relatively stabilized on August 8 (Day 5), three sets of influent and effluent vapor samples were collected and analyzed using all three VOC measurement methods: TO-14, EPA 8021 & E18, and PID readings.

QC Sampling

A field duplicate was collected on Day 5 and analyzed by E18/EPA 8021 to provide a QC check of the samples submitted for analysis to the onsite laboratory. The duplicate was collected by simultaneously filling two Tedlar® bags. A stainless steel "T" in the tubing was used to split the flow to the bags.

On Day 5, one field blank was also collected in a SUMMA® canister at a location 20 feet away from the operation equipment and 5 feet above ground surface during relatively calm wind conditions for analysis by TO-14.

4.4.2 Technology Operation

The following sampling strategy was implemented during the test phase on December 3, 1997.

4.4.2.1 Adsorbent Sampling

Sampling proceeded during the test phase in accordance with the modified sampling schedule shown in Table 2 (*HLA, 1997n*). After the beads had been processed through about 16 desorption cycles, a resin sample was collected and tested for TPHg, THPd, and TPHo using EPA 5030/modified 8015. VOCs were analyzed using EPA 8420. The results of these analyses show the baseline of residual hydrocarbon concentrations on the resin beads after an extended desorption process at 425°F.

When the FBA system shut down at the end of the test, HLA collected Ambersorb®600 resin samples from the adsorber and desorber. These samples were collected to assess mass loading on the resin beads after well air was processed during one cycle of the beads inside the FBA test unit.

4.4.2.2 Process Gas Sampling

Once well air was introduced as the process gas, three influent and effluent vapor samples were collected for separate analyses by PID, E18/ EPA-8021, and TO-14 and a field duplicate was collected and analyzed by E18/EPA 8021 to provide a QC check of the samples submitted for analysis to the onsite laboratory. The field duplicate was collected by simultaneously filling two Tedlar® bags. A stainless steel "T" in the tubing was used to split the flow to the bags.

Influent and effluent concentrations were monitored with a PID each half-hour during the 2 hours of testing when the system shut down just over 2 hours after it was initiated. Influent and effluent samples were also collected in Tedlar® bags and SUMMA® canister after 2 hours of operation and analyzed using E18/ EPA-8021 and TO-14, respectively. Flow rate and concentration data for VOCs entering and leaving the FBA test unit were compiled and used to calculate the mass removal rate.

Influent and effluent VOC concentration data was used to calculate destruction and removal efficiencies (DREs) for the system while the test progressed, as discussed in Section 5.1.2. Field measurements and laboratory analyses of influent and effluent samples collected during the test were used to assess the effectiveness of the system to treat compounds relative to mass loading on the resin beads.

Sampling and data collection procedures were the same used during startup (Section 4.4.1.2). These include monitoring system operating parameters (flow, pressures, temperatures) during each field visit. Tedlar® bag and SUMMA® canister sample collection and analysis also followed the same procedures.

4.4.2.3 Utility and Material Costs

Utility and material usage data were recorded to analyze unit costs for operation and to identify savings relative to comparable technologies. HLA recorded hours of operation, electricity and nitrogen usage, and amount of product recovered during the test:

- Hours of operation were recorded by a built-in hour meter in the extraction system control box.

- Power consumption was estimated by measuring the current drawn by the FBA test unit and extraction blower during each site visit. Current draw was measured using an AMPROBE® and recorded in a log sheet. The unit rate for electrical consumption was calculated by multiplying the current draw times the nominal voltage.
- Nitrogen and water usage were measured with dedicated flow meters.
- Qualitative assessment of the amount of product recovered was conducted by a visual inspection of the liquid condensate in the condensate drum. The proportion of product and water was visually estimated and the distribution of hydrocarbons was determined by laboratory analysis of the recovered liquid.

Labor costs during the demonstration were not representative of typical continuous operations because the FBA test unit only operated intermittently. For the same reason, full life-cycle operation costs for the system were not developed based on FBA test results; however, operation expenses are discussed as unit costs.

4.4.2.4 Noncorrosive Discharge

Corrosion monitoring of the FBA test unit effluent vapor stream was conducted to demonstrate noncorrosive discharges. Corrosion impacts were monitored inside the FBA test unit discharge stack by means of a CORROSOMETER® probe (probe) and in the desorber by measuring the pH of the condensate. These two locations were selected because of their proximity downstream from the heat source in the desorber where acid would most likely be formed. The probe mass was recorded a minimum of four times per day to provide a time log of mass loss from corrosion; the results were used to calculate the corrosion rate of the stack internal coating. Periods of accelerated corrosion were cross-referenced with operation logs to identify activities that may have increased corrosion.

Corrosive impacts from system offgases were measured on a continuous basis throughout the test in accordance with CORROSOMETER® operating procedures. The electrical resistance corrosion probe was placed inside the discharge stack. The probe was a loop-style element (approximately 2 inches long; it threads into a ¾-inch-diameter opening) constructed using 304 stainless steel, which is a grade of metal similar to that used to construct the stack for a commercial-size unit. A CORRDATA® remote data collector (RDC) monitored real-time mass reduction of the probe at predetermined time intervals. The field technician periodically collected the accumulated mass reduction data recorded by the RDC using a MATE® portable data logger (logger); the data were transported to the office and transferred to a personal computer equipped with CORRDATA® software that provides graphical displays of corrosion time history over the project duration (Figure 1).

Corrosion impacts were monitored in the desorber by testing the pH of the condensed liquid product and/ water (condensate) upon completion of closeout testing. At the conclusion of the test phase, one condensate sample was collected for pH analysis in a wide-mouth glass jar with a virgin Teflon® cap liner. The condensate sample was collected from a bung in the condensate drum using a peristaltic pump with inert tubing and stored in an iced cooler. The condensate sample was transported under chain-of-custody protocol to a state-certified laboratory for pH analysis by EPA Method 9040.

4.4.2.5 Oxides of Nitrogen (NOx)

Because continuous operation of the FBA could not be achieved and monitoring data indicated that disrupted bead flow adversely affected the resin performance, sampling for NOx was not conducted. Limited FBA operation time would not accommodate conducting a one-day source test for NOx in accordance with the SOP for California Air Resource Board (CARB) Method 100 (WIP Appendix C).

4.4.2.6 Downtime

The operating status of the FBA test unit was documented to chronicle how long continuous operations could be sustained to identify trends in bead flow disruptions for diagnostic purposes. During each site visit, the field technician recorded the operating time between field visits. Downtime events were documented and an explanation as to the cause e.g., inconsistent bead flow, cat-ox shutdown, power outage).

A motor-driven AC hour meter was used to record hours of operation of the blower and FBA test unit. During each site visit, the field technician recorded the hour meter reading and calculated the total hours of operation since the previous visit. The hour meter was also be used to estimate date and time of each shutdown event.

4.4.3 Post-Demonstration Sampling

4.4.3.1 Adsorbent Followup

After completing the test and operating the system using ambient air as the process gas, HLA collected Ambersorb®600 resin samples from the adsorber and desorber to quantify residual hydrocarbon concentrations on the resin before decommissioning the apparatus. The samples were collected in an 8-ounce glass jars and tested for TPHg using EPA 5030/modified 8015. VOCs were analyzed using EPA 8420. The mass of constituents observed on these follow-up samples were compared to results from the baseline sample of virgin Ambersorb®600 (Section 4.4.1.1) and the samples collected during the test phase (Section 4.4.2.1).

4.4.4 Shut-down Monitoring

4.4.4.1 Recycled Product

Samples of the product condensate were analyzed to demonstrate that the product is suitable for recycling rather than disposal. Waste characteristics were evaluated for handling purposes for acceptance at an offsite recycling facility operated by Romic Environmental Technologies Corporation (Romic), in East Palo Alto, California. Upon receipt of the product, Romic provides documentation that the condensate was delivered to and became the property of the recycling facility. Romic recovers the various constituents as a recycled solvent or blends the product into heating fuel for use in a cement kiln furnace.

Condensate samples were collected and analyzed to evaluate the product's fuel grade characteristics. Laboratory analyses provided a chemical profile of the condensate collected. Analysis of the laboratory data was used to identify future system operational parameters that maximize recycling characteristics of the condensate.

Samples were collected from each identifiable phase in the condensate drum. The sampler visually identified phase separation in the condensate drum. Condensate samples were transferred to laboratory-supplied vials, which were stored in an iced cooler and transported the laboratory with a chain of custody record. The samples were analyzed in accordance with the SOP for EPA Test Method 8240 (WIP Appendix C) to quantify the type and distribution of VOCs and any water content. To classify the product's fuel grade characteristics, Romic conducts additional analyses at its laboratory, including water content, total dissolved solids, total suspended solids, pH, and chloride content.

4.4.5 Quality Assurance Sampling

Analytical results from the study were validated according to procedures specified in the Final WIP (*HLA, 1997i*) and in the Quality Assurance Project Plan (QAPP), Version 1.1 (*AFCEE, 1996*). The validation process examines the quality of the data with respect to a set of quality control (QC) criteria, including precision, accuracy, and representativeness. The QC samples used to assess data quality consisted of laboratory duplicate samples, matrix spike/matrix spike duplicates (MS/MSD), laboratory control samples (LCS), method blanks, and blanks generated in the field. Holding times, laboratory surrogate spike recoveries, initial calibrations, and continuing calibrations were also evaluated. However, not all QC results were available for review for all analyses. This section documents the findings of the data validation. Findings or QC results that are within acceptance criteria (as defined by the QAPP) are not mentioned herein; this section only describes results outside of acceptance criteria, given information provided in laboratory data packages.

4.4.5.1 Project Data Quality Objectives

The initial project objectives were generally to demonstrate cost-effective treatment operations (*HLA, 1997i*). However, these objectives were modified to assess treatment performance while processing chlorinated VOCs

mixed with a blend of fuel hydrocarbons, as described in Section 2.4 of this report. Consequently, the sampling program was modified to evaluate how treatment performance is affected as hydrocarbons accumulate on the resin beads. Data quality objectives for the modified demonstration were refocused toward a diagnostic evaluation of FBA operations rather than on rigorously documenting that operations met specified treatment performance standards. These revised data quality objectives were considered during data validation.

4.4.5.2 Quality Control Exceedances

Three resin bead samples and two condensate samples had high surrogate recoveries for the VOC analysis. The degree of exceedance was minor and can be attributed to matrix interference from high levels of hydrocarbons present in the samples. LCS results indicate that analyses were performed correctly. The consequences of the surrogate exceedances are minor with respect to project objectives because data are still suitable for supporting the diagnostic performance evaluation.

Several continuing calibration verification (CCV) standards for the VOC analysis by EPA Test Method 8021 were outside the 15 percent difference criteria. However, exceedances were minor with less than 35 percent difference. The consequences of CCV exceedances are minor with respect to project objectives because data are still suitable for supporting a diagnostic performance evaluation.

4.4.5.3 QC Summary

Original project objectives were modified after project startup. Data validation was performed on project samples in accordance with the WIP and QAPP guidelines, with a perspective of the modified demonstration scope. A few minor QC exceedances were noted. However, data validation results indicate that project data are suitable for supporting revised project objectives.

5.0 TECHNOLOGY PERFORMANCE EVALUATION

5.1 Performance Data

This section provides a summary and evaluation of the performance data collected during the FBA demonstration.

5.1.1 Process Stream Characterization

Data were collected from the FBA demonstration as discussed in Section 4.4. The following process streams are discussed in this section:

- "Air Influent" is the influent vapors from VW-5001 entering the FBA test unit; samples are labeled "FBAI-xx".
- "Air Effluent" is the effluent vapors leaving the FBA test unit; samples are labeled "FBAE-xx".
- "Liquid Effluent" is the effluent liquids that have been recovered from vapors and condensed into a liquid by the FBA test unit; samples are labeled "PCOND-xx".
- "Solid Medium" is the Ambersorb® 600 resin beads; samples are labeled "RESIN-xx", "ADSORB-xx", or "DESORB-xx".

Laboratory analytical reports are attached in Appendices B, C, and D and chemical analyses results are summarized in the following tables:

Table 1. FBA Field Readings

Table 2. FBA Sampling Schedule

Table 3. Vapor VOC Concentrations - TO-14 (Appendix B)

Table 4. Vapor VOC Concentrations - EPA 8021 & E18 (Appendix C)

Table 5. Vapor VOC Destruction and Removal Efficiencies

Table 6 - Resin VOC Concentrations - EPA 8240 & modified 8015 (Appendix D)

Table 7. Condensate VOC Concentrations - EPA 8240 & m8015 (Appendix D)

Table 8. Relative Humidity (RH) and Temperature Readings

For discussion purposes, hydrocarbon concentration results are grouped into two categories: petroleum hydrocarbons and chlorinated VOCs:

- ***Petroleum Hydrocarbons.*** Petroleum hydrocarbon concentration measurements of TPH, Total Volatile Hydrocarbons (TVH), and Non-methane Organic Compounds (NMOCs) quantified a diversified mixture of hydrocarbons typically exhibited by petroleum-based products such as fuels and lubricating oils. The petroleum hydrocarbons observed generally ranged in size from C_7 to C_{13}. Although this size-range of hydrocarbons is also observed in gasoline, the types of molecular structures observed were very different; the petroleum hydrocarbons at IC 31 were primarily branched alkanes (straight-chain hydrocarbons with branches of methane and ethane) rather than the alkanes and aromatics (straight-chain and benzene ring hydrocarbons) typically found in gasoline. Although the compounds involved with petroleum hydrocarbon mixtures are too numerous for laboratory techniques to quantify all of the constituents as individual analytes, the most prevalent petroleum hydrocarbon constituents are presented in the attached laboratory reports (Appendices B and D) as tentatively identified compounds (TICs). TIC results are not summarized on tables due to the wide variety of

branched alkanes identified and the subjective nature of their quantification. BTEX concentrations are not included in the tables because these compounds generally represented less than 1 percent of the petroleum hydrocarbons in the process gas from VW-5001.

- ***Chlorinated VOCs.*** Chlorinated VOC concentrations are measured as specific analytes by the standard analytical methods specified in Section 4.4. The list of analytes includes ethene-and ethane-based chlorinated hydrocarbons that have been manufactured for use as solvents, such as TCE and PCE. Known TCE degradation byproducts, such as 1,1-DCE and 1,1,1-TCA, are also included as analytes. Because there are so few compounds associated with commercial solvents, it is practical to quantify each of these chlorinated VOCs individually. The 10 chlorinated VOCs commonly detected during this demonstration are presented as "Target Chlorinated VOCs" in Tables 3, 4, 6, and 7; "Total Chlorinated VOCs" is a combined concentration calculated as the sum of the target individual chlorinated VOC concentrations reported by the laboratory for each sample, rounded to two significant figures.

5.1.1.1 Air Influent

Influent air characteristics are summarized below using the target compounds from the list of laboratory analytes:

Process Air Influent Concentrations (ppmv)

	Test Method	8/8/97 Startup	12/3/97 Begin Test	12/3/97 End Test
TVH	TO-14	1,200	380	390 ppmv
NMOCs	E18	3,900	2,700	2,300 ppmv
Total Organics	PID Readings	491	487	538 ppmv
Total VOCs	TO-14	37	22	27 ppmv
	EPA 8021	75	78	61 ppmv
TCE	TO-14	22	13	16 ppmv
	EPA 8021	21	11	11 ppmv

Petroleum Hydrocarbons

Between the collection of startup samples and the FBA test in December 1997, influent TVH concentrations decreased substantially, from 1,200 to 380 ppmv, respectively, using TO-14. The decreasing TVH concentrations with time are consistent with the previous trend exhibited by VW-5001. The initial TVH concentration in August 1996 was 3,500 ppmv. Startup screening data indicate that influent petroleum hydrocarbon concentrations were similar for the Day 1 and Day 5 sampling events on July 17 and August 8, 1997.

During the brief test phase on December 3, 1997, the total hydrocarbon concentration in the process air influent from VW-5001 remained stable, within a variance of less than 15 percent as measured by TO-14, E18, and PID. TVH concentrations of 380 and 390 ppmv were reported in the influent start- and end-test samples (FBAI-104 and FBAI-105), respectively, as definitively measured by TO-14. Screening measurements showed slightly more variable influent concentrations during the test, as reported by E18 analytical methods (2,700 to 2,300 ppmv NMOCs) and PID readings (487 to 538 ppmv).

Chlorinated VOCs

From the time startup samples were collected in August to the test in December 1997, influent total VOC concentrations decreased from 37 to 22 ppmv by TO-14. TCE contributed 40 to 60 percent of the chlorinated VOC mass, with concentrations decreasing from 22 to 13 ppmv between August and December 1997.

During the test phase on December 3, 1997, influent VOC concentrations measured by EPA 8021 and TO-14 remained stable within a variance of less than 23 percent. TO-14 results indicate that total VOC concentrations of

22 and 27 ppmv contribute approximately 5 percent (by volume) of chlorinated VOCs to the influent petroleum hydrocarbons, as quantified by TVH. TCE makes up about 2 percent of the influent fuel mixture.

Moisture / Relative Humidity

Influent relative humidity was reduced by eliminating the upstream heat exchanger and incorporating a second moisture knockout vessel to reduce water condensation inside the FBA test unit. During startup optimization in August 1997, relative humidity readings were recorded at 83 percent with an ambient temperature of 64° F and 35 percent when ambient temperatures reached 100° F.

5.1.1.2 Air Effluent

Petroleum Hydrocarbons

Petroleum hydrocarbon concentrations observed in the effluent gas on August 8 were higher than at the end of the test phase on December 3, 1997 (TVH of 710 ppmv and 260 ppmv, respectively, based on TO-14). Screening results using E18 and PID reflected a similar decrease in the total hydrocarbon concentrations in the effluent between August and December 1997. Process air effluent PID readings on July 17, 1997, the first day of FBA startup, were an order of magnitude lower than influent readings.

During the test phase on December 3, 1997, the total hydrocarbon concentration in the air effluent from the FBA test unit threefold as measured by each of the three analytical monitoring methods used: PID, E18, and TO-14. TVH concentrations increased from 66 to 260 ppmv, as measured by TO-14 in the influent start- and end-test samples, respectively. Screening measurements showed similar increases during the test, as reported by E18 analytical methods (480 to 1,400 ppmv NMOCs) and PID readings (67 to 188 ppmv).

Chlorinated VOCs

Chlorinated VOC concentrations observed in the effluent gas on August 8 were higher than at the end of the test phase on December 3, 1997 (17 ppmv and 10 ppmv, respectively, using TO-14). Screening results using EPA 8021 reflected a similar decrease in the total hydrocarbon concentrations between August and December 1997.

During the test phase on December 3, 1997, VOC concentrations in the air effluent from the FBA test unit increased threefold based on both EPA 8021 and TO-14 measurements. TO-14 results from the effluent start- and end-test samples show total VOC concentrations increasing from 3.3 to 10 ppmv and TCE concentrations increasing from 1.2 to 4.7 ppmv. Screening measurements using EPA 8021 showed a similar trend during the test, with total VOC concentrations increasing from 9.8 to 29 ppmv and TCE increasing from 1.2 to 3.6 ppmv.

NOx

NOx measurements were not conducted during the test; however, with a maximum temperature of 425° F inside the FBA test unit, hydrocarbon oxidation processes that result in the production of NOx in the effluent are not anticipated.

Corrosivity

Figure 1 is a graphical presentation of the amount of probe metal lost over the duration of the demonstration. Two periods of corrosion were observed that correlate with system operations conducted during startup operations (mid-July through mid-September 1997) and the test phase (early December 1997). Metal loss was recorded during these timeframes when the system was operating, compared with no metal loss during October 1997, when the system was dormant.

Both of the operating periods showing reductions in probe mass exhibit the same corrosion rate of 0.001 inch (1 mil) per year, as determined by the corrosometer software using a best fit line calculated by linear regression.

Because the system only operated intermittently, the corrosion rate during continuous operations could be as much as 2 mils per year, based on discussions with the corrosion meter manufacturer, Rohrback Cosasco Systems, Inc. These results demonstrate about 10 times less corrosion than a 25 percent hydrochloric acid solution on a 316 stainless steel surface (*McGraw-Hill, 1984*), which is similar to the acidic discharge characteristics from oxidized air abatement processes such as catalytic oxidation.

5.1.1.3 Process Liquid Effluent

Based on field observations while using the peristaltic pump for sampling on December 3, 1997, the process liquid effluent was reported to be a clear-amber separate phase product (visually estimated at 80 percent) floating on top of dark-amber water (estimated at 20 percent). Chemical analysis results from the product and water effluents are summarized below:

Product

The product sample (PCOND-102) had a TPHg concentration of 270,000 milligrams per kilogram[3] (mg/kg), or roughly 27 percent; TPHd and TPHo were not detected above the reporting limit of 5,000 mg/kg. The total VOC concentration was 10,400 mg/kg, or roughly 1 percent. With concentrations of 9,300 and 1,100 mg/kg, respectively, TCE and PCE were the only VOC analytes detected above the laboratory detection level of 500 mg/kg.

Water

The water sample (PCOND-101) had a TPHg concentration of 1,400 mg/kg; TPHd and TPHo were not detected above the reporting limit of 5,000 mg/kg. The total VOC concentration was 9,089 mg/kg. TCE was the most prominent single VOC constituent at a concentration of 7,800 mg/kg with PCE, 1,2-DCE, chloroform, and 1,1-DCA detected at 460, 260, 240, and 190 mg/kg, respectively.

pH

The liquid condensate was relatively noncorrosive, with a pH of 6. Although slightly acidic (neutral pH is 7), the results indicate that the FBA demonstration did not produce substantial amounts of acid as a byproduct in the effluent condensate.

5.1.1.4 Solid Medium

Petroleum Hydrocarbons

The virgin bead sample (RESIN-01) had a TPHd concentration of 8 mg/kg. Although this resin had never been used, Rohm & Haas does not supply organic-free product unless the purchaser specifies and pays for "food-grade" quality. After circulating the beads during initial startup operations, TPHd and TPHo were not detected in bead samples collected from the adsorber and desorber on August 8, 1997.

The highest residual hydrocarbon concentrations were observed on resin samples collected August 8, 1997, after the beads had completed approximately 80 cycles through the adsorber and desorber while treating process gas containing VOCs. TPHg was detected in the desorber and adsorber bead samples (DESORB-03 and ABSORB-01) at 9,700 and 15,000 mg/kg, respectively; the hydrocarbon mixture primarily contained branched alkanes with total reported TIC concentrations of 5,660 and 10,884 mg/kg, respectively.

The lowest residual hydrocarbon concentration was observed after the extended desorption process was completed prior to testing on December 3, 1997; resin sample ADSORB-101 had a TPHg concentration of 730 mg/kg. At the

[3] Laboratory presented results in units of mg/kg instead of milligrams per liter (mg/l) because the constituents are not dissolved in a water matrix.

end of the test, when most resin beads had made one pass through the adsorber, ADSORB-102 had a TPHg concentration of 10,000 mg/kg. The bead sample collected from the desorber (DESORB-101) at the end of the test contained 790 mg/kg TPHg; however, the test period may have been too brief for this sample to contain beads that had made a complete pass through both the adsorber and desorber after the extended desorption process.

The final resin sample collected on December 13, 1997, ADSORB-103, after 3 cycles through the desorber and prior to decommissioning FBA apparatus, had a TPHg concentration of 2,200 mg/kg.

Chlorinated VOCs

No chlorinated hydrocarbons typically associated with solvents were detected in the virgin bead sample (RESIN-01).

The highest residual chlorinated VOC concentrations were observed on resin samples collected August 8, 1997, after the beads had completed approximately 80 cycles through both the adsorber and desorber while treating process gas containing VOCs. Total VOCs were detected on the desorber and adsorber bead samples (DESORB-03 and ABSORB-01) at 1,200 and 1,000 mg/kg, respectively. TCE makes up about 80 percent of the total chlorinated VOC concentration.

Residual chlorinated VOC concentrations were reduced by an order of magnitude after the extended desorption process was completed on December 3, 1997; resin sample ADSORB-101 had a total chlorinated VOC concentration of 196 mg/kg. At the end of the test, when resin beads had made one pass through the adsorber, ADSORB-102 contained total chlorinated VOCs at 440 mg/kg. The bead sample collected from the desorber at the end of the test, DESORB-101, had 160 mg/kg total chlorinated VOCs.

The final resin sample collected on December 13, 1997, ADSORB-103, after 3 cycles through the desorber and prior to decommissioning FBA apparatus, had a TCE concentration of 100 mg/kg. Demonstration results show the resin can continue to be used and, if necessary, lower residual concentrations can be achieved with additional desorption.

Inorganics

The results of elemental analyses on ADSORB-01 are as follows, the laboratory report is in Appendix E:

Carbon	83.19 %
Hydrogen	3.36 %
Oxygen	2.52 %
Nitrogen	0.02 % (ND)
Sulfur	8.64 %
Iron	0.14 %
Total	97.87 %

5.1.2 Mass Balances

This section provides data assessment and an evaluation of the test results

5.1.2.1 Air (DREs)

Destruction and Removal Efficiency:

$$\text{DRE, expressed as a percentage} = \frac{(\text{influent concentrations - effluent concentrations}) \times 100}{(\text{influent concentration})}$$

DRE calculations are based on the TO-14 results. For comparative purposes, screening measurements reported by E18, resulted in NMOC DREs that correlated well (within 6 percent) with the definitive TVH DREs. The PID DREs had more variability, correlating within 32 percent of the TVH DREs. The screening and definitive DREs showed the closest correlation (within 3 percent) at the beginning of the test after the extended desorption process.

Petroleum Hydrocarbons

The highest TVH DRE of 84 percent was observed at the beginning of the test on December 3, 1997, after the extended desorption process, and the lowest TVH DRE of 33 percent was observed at the end of the test. A relatively low TVH DRE of 43 percent was observed on August 8 after the FBA test unit had intermittently processed well air for approximately 190 hours during startup operations. The highest PID reading DRE of 95 percent were observed on July 17, 1997, the day that FBA test unit startup operations commenced.

Chlorinated VOCs

The highest DRE of 91 percent for TCE was observed at the beginning of the test on December 3, 1997, after the extended desorption process; the total chlorinated VOC DRE was 85 percent. A relatively low total VOC DRE of 63 percent was observed at the end of the test. The lowest chlorinated VOC DRE of 53 percent was observed on August 8 after the FBA test unit had intermittently processed well air for approximately 190 hours during startup operations.

Comparative Performance Evaluation

Test results demonstrate the performance of Ambersorb® 600 at various stages of residual hydrocarbon loading. A comparison of the test data indicates two performance characteristics: .

1. According to Rohm & Haas, Ambersorb® 600 preferentially adsorbs chlorinated VOCs relative to nonchlorinated hydrocarbons; this characteristic was reflected by the demonstration results involving TCE and PCE removal. At the times of lowest removal efficiencies, the TCE and PCE DREs were 10 to 20 percent higher than the total VOC and TVH DREs; definitive and screening DRE results for TCE and PCE correlate well (within 4 percent).

2. Demonstration results indicate that DRE performance for both chlorinated and nonchlorinated VOCs is inversely related to the residual hydrocarbon concentrations on the resin beads (see Section 5.1.2.3).

Relative Humidity

As the process gas passed through the FBA test unit, the temperature decreased, causing an increase in the relative humidity. After operations were adjusted in August 1997, relative humidity was observed to be below saturation throughout the system, thereby reducing water condensation in the FBA test unit.

5.1.2.2 Liquid Condensate

Product

The product sample (PCOND-102) is primarily composed of petroleum hydrocarbons with a relatively small portion of chlorinated VOCs (3.7 percent total chlorinated VOCs). The proportion of free-phase product constituents was similar to that in the influent air stream (total chlorinated VOCs / TVH = 2 to 7 percent). The fraction of chlorinated VOCs in the free-phase product may also have been affected by weathering because the liquid condensate remained in storage drums onsite for several months while the FBA test unit was not operating. The more volatile compounds may have gradually dispersed back into the FBA test unit while purge gas was not continually flushing the VOCs back into the storage drums.

Water

The water sample (PCOND-101) contained about 630 percent total chlorinated VOCs relative to TPHg, a much higher proportion than was generally observed in the product sample (3.7 percent) or air stream (2 to 7 percent). The higher proportion is likely due to the relative solubility of the various constituents because the water condensate, being in continuous contact with the product, would likely be completely saturated with dissolved hydrocarbons.

5.1.2.3 Process Solid Medium

Mass Loading on Resin

Resin bead analysis results demonstrate the following mass loading characteristics of Ambersorb® 600 at various stages of desorption:

1. Demonstration results indicate that the mass of residual hydrocarbons on the resin is inversely related to the vapor DREs. The best DREs for all constituents were achieved when the lowest THPg and VOC concentrations were observed on the resin after completing the extended desorption process. Decreasing DREs are observed with corresponding increases of residual TPHg and VOC concentrations adsorbed onto the resin.

2. As total mass loading increased on the resin, petroleum hydrocarbons from the influent process gas preferentially accumulated onto the resin beads, relative to the chlorinated constituents, indicating that the

adsorption preferences of the resin are influenced by the residual organic constituents on the surface. This feature is most readily observed by comparing the proportion of chlorinated VOCs to petroleum hydrocarbons, as represented by TPHg. After the extended desorption process was completed on December 3, the resin beads exhibited the highest proportion of chlorinated VOCs to TPHg (26 percent), which then decreased to 4 percent on loaded adsorber beads at the end of the test. A lower proportion of chlorinated VOCs was also detected on the resin on August 8, 1997 (between 8 and 10 percent) than the 26 percent observed after the extended desorbtion process. In addition, the decreased proportion of chlorinated VOCs on loaded resin beads observed from August to December (total VOCs/TPHg decrease from 8 to 4 percent) indicates that the residual hydrocarbons adsorbed to the resin increasingly exhibited a certain degree of recalcitrant fuel constituents over time.

Inorganics

The results of elemental analyses of ADSORB-01 met the Rohm & Haas specifications (less than a 5 percent total variance), indicating that inorganic substances such as rust did not appear to affect the physical or adsorption properties of the resin.

Adhesion

The tendency for adhesion between resin beads to disrupt bead flow increased as the demonstration progressed. The most significant correlation between adhesion and chemical results is the relative proportion of chlorinated VOCs adsorbed to the resin. Resin samples collected after the system shut down due to disrupted bead flow on December 3 contained residual hydrocarbons with less than 4 percent chlorinated VOCs; samples collected while the beads could circulate contained more than 10 percent chlorinated constituents in the residual hydrocarbons. These data indicate that the resin surface may become adhesive when less than about 5 percent of the residual organics are chlorinated VOCs; however, data are insufficient to state this finding conclusively.

5.2 Remediation Efficiency

This section accesses FBA system relative to the treatment performance objectives.

5.2.1 System Performance

BACT Treatment Criteria

The Best Available Control Technology (BACT) treatment criterion for VOC removal of 95 percent DRE was approached by the FBA test unit for TCE, with a DRE of 91 percent after the extended desorption process. Only the initial PID readings demonstrated a DRE of 95 percent at startup. The highest observed DREs for TVH and total chlorinated VOCs were 83 and 85 percent, respectively, below the BACT criterion. However, these DREs could not be sustained with continued operation of the current FBA test unit, which was initially designed to process the more volatile chlorinated compounds. Results from this demonstration indicate that FBA technology removed organics from mixed waste streams, but the FBA test unit, as currently configured, is unable to achieve the BACT criterion consistently. Additional process modifications are apparently needed to achieve the BACT criterion at sites having substantial amounts of fuel constituents.

The FBA treatment was most successful at processing TCE and PCE, which had DREs ranging from 62 to 91 and 71 to 91 percent, respectively, that were not significantly impacted by hydrocarbons accumulating on the resin beads during operations. Lighter chlorinated constituents, such Freon 113 and 1,1,1-TCA, had the lowest DREs, ranging from 3 to 43 percent and 24 to 67 percent, respectively. The lower DREs are likely due to the adsorption characteristics of Ambersorb® 600, which appear to preferentially adsorb PCE and TCE relative to nonchlorinated hydrocarbons, with other chlorinated VOCs like Freon 113 being the least preferentially adsorbed.

Noncorrosive Emissions

Limited corrosion resulted from the system offgases during operations, as measured with a CORROSOMETER®. The corrosion rate measured during this demonstration indicates that the stack wall thickness in commercial FBA systems need to anticipate 10 to 20 mils of corrosion for every 10 years of operating life. These corrosion rates are substantially below those observed from oxidizing air abatement systems that produce hydrochloric acid as a byproduct.

NOx Emissions

Monitoring of nitrogen oxides (NO_x) was not conducted because stabilized FBA operations could not be sustained within the CARB 100 testing standards.

Adsorb/Desorb of High Boiling Point Compounds

Test results show that the oil-heated desorber reduced VOC concentrations on the resin. The data show that all of the organic constituents detected on resin samples are reduced by volatilization in the desorber, indicating that the constituents have boiling points below the desorber temperature of 425 F; however, the rate at which volatilization occurred was slow enough to adversely impact the FBA treatment efficiency during this demonstration. Hydrocarbon mass accumulated on the resin because each pass through the adsorber added more mass than could be removed by a pass through the desorber.

The demonstration showed that treatment efficiency was higher if the mass load on the resin beads entering the adsorber was lowered. Extending the desorption time by operating without hydrocarbon-laden air passing through the desorber reduced the residual organic mass on the resin beads and provided additional adsorption capacity when process air was reintroduced to the influent.

5.2.2 System Treatment Performance Enhancements

Modifications that would likely enhance treatment performance have been identified based on the findings from this demonstration.

Longer Desorb Cycle

Treatment performance appears to be enhanced by a longer desorb cycle. More desorption time improves the removal of hydrocarbons from the resin, resulting in higher DREs. A longer desorber retention time will provide the beads entering the adsorber with additional adsorption capacity. DREs are anticipated to improve during continuous operations because the residual hydrocarbon mass on the resin will stabilize at lower steady-state concentrations throughout the FBA system.

Longer Adsorb Cycle

Treatment performance would be enhanced by a longer adsorb cycle. DREs would be improved by extending the adsorber retention time because air passing through the adsorber would contact an additional mass of desorbed beads and transfer incrementally greater mass, provided the beads do not achieve chemical saturation.

5.3 Process Flow Efficiency

This section evaluates FBA process efficiency relative to the implementability and cost objectives.

5.3.1 Process efficiency Performance

Product Recycling

The FBA test unit demonstrated its ability to capture VOCs from process gas for recovery as a recyclable product. Romic determines the fuel-grade characteristics for recovery value and transport requirements; the condensed liquid effluent from this demonstration was classified as "fuel grade" for recovery at Romic's offsite recycling

facility. If no free-phase product were present, the water condensate would be classified by Romic as "water grade" because only dissolved hydrocarbons are available for recovery. With 20 percent water content, this condensate would receive a moderate or poor recovery rating of Fuel Grade 2 or 3, respectively, on a fuel grade rating scale of 3. If the water content were less than 10 percent for a better fuel grade rating of 1, other parameters measured by Romic might lower the fuel grade rating, including BTU content, PCBs, suspended solids, and chloride.

Although the condensate processed at Romic's facility is a recyclable product, waste transportation protocol is used to handle the material during transport, including the use of Hazardous Waste Manifests. Romic is licensed to pick up and transport the liquid product to the recycling facility. Because the FBA test was conducted at a CERCLA remediation site, the recovered liquid product does not qualify as a Resource Conservation and Recovery Act (RCRA) listed waste.

Reduced Energy Use

Power utilization was measured during both phases of testing at the site; once during treatment of high influent VOC concentrations and again during the treatment of low concentrations. With a total energy draw of about 55 amps (30 and 20 amps from the FBA test unit and SVE blower, respectively), this demonstration shows that FBA involves lower energy use than other SVE treatment technologies.

Cost Effectiveness

Cost effectiveness could not be evaluated from data obtained during this demonstration because the necessary data were unavailable due to the intermittent operation of the system. The test scope was modified to focus on specific treatment parameters rather than an assessment of costs during continuous operations.

Ninety Percent Operating Time

Ninety percent operating time was not a relevant criterion for this demonstration because of the inconsistent bead flow observed in the FBA test unit. The demonstration scope and objectives were modified accordingly, as discussed in Sections 2.2 and 2.4, respectively.

6.0 OTHER TECHNOLOGY ISSUES

This section presents a discussion of regulatory requirements, personnel health and safety issues, and community acceptance issues as they impact the degree of future success for this remediation technology.

6.1 Environmental Regulatory Requirements

Several regulatory requirements are pertinent to site remediation using the FBA technology; potentially applicable regulations are discussed below.

6.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

Remediation activities at IC 31 are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, in response to releases of hazardous substances, pollutants, or contaminants to the air, water, and land that may present an imminent and substantial danger to public health or welfare (Federal Register, 1990).

6.1.2 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, is the primary federal legislation governing hazardous waste activities. Subpart C of RCRA contains requirements for the generation, transport, treatment, storage, and disposal of hazardous waste.

The FBA treatment process does not generate waste, but rather recovers contaminants from the process gas as a recyclable product. McClellan AFB personnel have indicated that the VOCs recovered during the FBA test are not a RCRA listed waste because IC 31 is a CERCLA remediation site.

6.1.3 Clean Water Act

The Clean Water Act (CWA) regulates direct discharges to surface water through National Pollutant Discharge Elimination System (NPDES) regulations. The CWA does not apply to the FBA technology because municipal supply water is used for non-contact cooling purposes as it passes through the system prior to sewer discharge. During the FBA demonstration, non-contact cooling water was discharged to the onsite industrial sewer system, which must comply with the CWA.

6.1.4 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), as amended in 1986, establishes primary and secondary national drinking water standards and is not applicable to the scope of the FBA technology, although FBA may be utilized for remediation applications involving SDWA issues, such as remediation projects overseen by local and/or state regulatory agencies responsible for drinking water quality.

6.1.5 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) regulates testing, premanufacture notification, and record-keeping requirements for toxic substances and addresses the storage requirements for polychlorinated biphenyls (PCBs; see 40 CFR Part 761.65). In applications where FBA technology may be used to treat vapors containing PCBs, PCB storage requirements may apply to effluent condensate containing PCBs and may affect the ability to recycle the product generated. However, PCBs are not volatile at and, therefore, not anticipated to be found in SVE process gas.

6.1.6 Mixed Waste Regulations

Mixed waste contains both radioactive and hazardous components, as defined by the Atomic Energy Act (AEA) and RCRA, and must meet the requirements of both acts. When the application of both regulations results in a situation inconsistent with the AEA (for example, an increased likelihood of radioactive exposure), AEA requirements supersede RCRA requirements. Use of FBA at sites with radioactive contamination might involve the treatment or generation of mixed waste.

6.1.7 Federal Insecticide, Fungicide, and Rodenticide Act

Reserved.

6.1.8 Occupational Safety and Health Act

FBA technology must be operated in compliance with OSHA regulations (29 CFR Parts 1900 through 1926) to protect worker health and safety. Both Superfund and RCRA corrective actions must meet OSHA requirements, particularly Part 1910.120, Hazardous Waste Operations and Emergency Response. Part 1926, Safety and Health Regulations for Construction, applies to any onsite construction activities.

6.1.9 Clean Air Act

Clean Air Act requirements are implemented by local air districts. Air discharges at IC-31 are not subject to permitting by the Sacramento Air Quality Management District (SMAQMD) because remediation activities have been implemented under CERCLA. Although a permit is not needed, air abatement is still required to meet the SMAQMD BACT performance standard of 95 percent DRE for VOCs, which is promulgated from the Clean Air Act. Even though the FBA did not sustain BACT performance standards during this demonstration, BACT was maintained by the existing Cat-ox system that received all of the FBA effluent vapors.

6.2 Personnel Health and Safety

Personnel health and safety requirements are addressed by training requirements and a site-specific safety plan. A complete summary of health and safety requirements is presented in Appendix B of the final WIP (*HLA, 1997i*). Generally, one operator can respond to alarm notifications and conduct weekly checks. The unit operator should be capable of performing the following: (1) adjust air, bead, nitrogen, and cooling water flow rates to achieve desired DREs; (2) check the control panel on the FBA system; (3) perform simple field measurements (for example, PID concentration, temperature, and flow rate); (4) troubleshoot minor operational problems; and (5) collect samples for offsite analysis. A local laboratory can perform analytical work requiring more technical skills, such as VOC analyses. The frequency of collecting and analyzing samples will depend on site-specific permit requirements.

The unit operator also should have completed an Occupational Safety and Health Act (OSHA) initial 40-hour health and safety training course and annual 8-hour refresher courses before operating the FBA system at hazardous waste sites, in addition to participating in a medical monitoring program as specified under OSHA requirements.

6.3 Community Acceptance

The FBA technology is a fully enclosed system that recovers extracted contaminants for recycling. There is minimal potential to expose onsite personnel or the community to airborne contaminants. If a malfunction occurs, alarm conditions automatically shut off the system.

The liquid product effluent provides the greatest potential chemical exposure associated with the system when product is removed and transported to the recycling facility. However, when the handled appropriately, the potential for exposure of onsite and offsite personnel is low.

The public generally favors processes that produce a recyclable product instead of a waste. The system itself is generally nondisruptive from an aesthetic perceptive, also resulting in favorable community acceptance.

The DFEs achieved during this demonstration did not sustain BACT standards and, without correction, could negatively impact the public. In order to gain community acceptance, the FBA system would need further development to achieve BACT.

7.0 COST ANALYSIS

7.1 Basis of Cost Analysis

Cost analysis is based on unit rates for the utilities and materials used during the FBA demonstration. Power and material utilization was documented during FBA intermittent operations for use in extrapolating the costs to full-time operations. The FBA demonstration costs are summarized in Appendix G.

7.2 Cost Categories

This section summarizes the costs from the FBA demonstration that may be relevant to full-scale operations.

7.2.1 Mobilization and Preparatory Work (33.01)

Mobilization and preparatory work was completed over a 2-week period at a cost of approximately $1,600. The skid-mounted FBA test unit and control panel (approximately 3,500 pounds) was transported to the site on a flat bed truck and unloaded using a fork lift ($800 freight). A nitrogen tank with regulator was dropped at the site using the vendor's boom truck ($800 mobilization). The trailer-mounted SVE blower and moisture knockout vessel was transported to the site on a standard ¾-ton pickup.

7.2.2 Monitoring, Sampling, Testing, and Analysis: Pre-Demonstration, Demonstration, and Post-Demonstration (33.02)

Monitoring costs from the demonstration are not reported because they are not representative of a continuous operation scenario.

7.2.3 Site Work (33.03)

A contractor was retained in addition to HLA's field technician to provide interconnecting piping and electrical connections; labor and material costs were approximately $4,700.

7.2.4 Surface Water Collection and Control (33.05)

Reserved.

7.2.5 Groundwater Collection and Control (33.06)

Reserved.

7.2.6 Air Pollution/Gas Collection and Control (33.07)

Because FBA did not sustain the BACT performance standard of 95 percent DRE, no full-scale costs can be accurately estimated from the results of this demonstration. However, HLA has been operating a full-scale FBA system for several years at a site exhibiting similar chlorinated VOCs near San Francisco Bay, without the presence of petroleum hydrocarbons. The FBA system at this site has a 300 scfm processing capacity (compared with the demonstration FBA test unit at IC-31 which had a 100 scfm capacity) with total estimated operating costs of $5,300 per month for equipment, nitrogen, water, power, and labor.

7.2.7 Solids Collection and Containment (33.08)

Not representative.

7.2.8 Liquids/Sediments/Sludges Collection and Containment (33.09)

Product collected from the test would qualify as Fuel-Grade 3 for recovery at Romic's recycling facility at a cost of approximately $240 per 55-gallon container. Based on operational data for FBA treatment at other sites, HLA has estimated a liquid removal rate of 3 to 6 gallons per day with a 80 percent liquid phase product and 20 percent water distribution. The resulting daily unit rate is approximately $13 to $26.

7.2.9 Drums/ Tanks/ Structures/ Miscellaneous Demolition and Removal (33.10)

The nitrogen vessel was removed by the vendor for a demobilization fee of $700.

7.2.10 Biological Treatment (33.11)

Reserved.

7.2.11 Chemical Treatment (33.12)

Reserved.

7.2.12 Physical Treatment (33.13)

The FBA test unit recovers VOCs from the process gas for recycling using a physical treatment process. The following utility and material costs, expressed as daily expenditures, were observed during system operations:

- Current draw for the FBA test unit and SVE blower were measured at 30 and 20 amps, respectively. HLA calculated a power usage of 12 and 8 kilowatts, respectively, resulting in a daily expenditure of $18 and $12, assuming continuous operations and a power cost of $0.061 per kilowatt-hour.

- Nitrogen costs included a rental fee of $350 per month for the 500-gallon nitrogen vessel and a unit rate of $0.01 per standard cubic foot (scf) of nitrogen. An average purge rate of 1.5 scfm during operation results in a nitrogen utilization rate of approximately 2,200 scf per day. The resulting unit cost for nitrogen is estimated at $33 per day.

- Municipal supply water was used for cooling purposes at a rate of 2 gallons per minute. Costs are based on a unit rate of $2.2537 for each 1,000-gallon of water, including a supply fee of $0.0537 and a sewer discharge fee of $2.23. The resulting daily rate for full-time water usage during this demonstration was approximately $6 per day.

Based on an extrapolation of the utility and materials unit rates to continuous operations, the FBA test unit costs approximately $75 per day to operate, with the SVE blower costing an additional $19 per day.

7.2.13 Thermal Treatment (33.14)

Reserved.

7.2.14 Stabilization/ Fixation/Encapsulation (33.15)

Reserved.

7.2.15 Decontamination and Decommissioning (33.17)

Decommissioning the FBA demonstration was accomplished in one day by HLA and a subcontractor for approximately $500.

7.2.16 Disposal (Commercial) (33.19)

Not representative.

7.2.17 Site Restoration (33.20)

Reserved.

7.2.18 Demobilization (33.21)

Not representative.

7.3 Results of Cost Analysis

An extensive cost analysis for complete life-cycle operations is not viable with the data from this demonstration. The demonstration results qualitatively indicate that FBA treatment operations can be cost effective compared with technologies such as catalytic oxidation and carbon adsorption. The test demonstrated relatively low energy and material usage costs.

8.0 CONCLUSIONS

8.1 Cost and Performance

FBA cost and performance conclusions are summarized in this section.

8.1.1 Treatment Performance

The results of the FBA demonstration support the following conclusions regarding treatment performance issues:

1. Without further development and testing, FBA technology is not appropriate for use at McClellan AFB sites where petroleum hydrocarbons are the primary constituents.

2. The FBA test unit achieved 91 percent DRE for TCE from air containing gasoline range petroleum hydrocarbons (C_5 to C_{12}) and a relatively small proportion (less than 3 percent) of chlorinated VOCs.

3. Treatment performance of Ambersorb® 600 deteriorates when residual mass loading on the resin exceeds 1,000 mg/kg TPHg.

4. The test indicated a desorber temperature of 425°F was sufficient to reduce the concentration of TPHg (including high-boiling compounds with carbon numbers as high as C_{13}) present on the resin beads; however, the resin beads do not have sufficient residence time within the desorber as presently configured to maintain a residual TPHg mass loading below 1,000 mg/kg. Residual TPHg concentrations below 1,000 mg/kg were achieved by additional desorption cycles without chemicals present in the influent air.

5. The volume of recalcitrant petroleum hydrocarbons remaining adsorbed to the resin increased as the test progressed. Based on a limited number of observations correlated with sampling events, bead cohesion was observed when the residual organic mass adsorbed to the resin contains less than 5 percent chlorinated VOCs. The beads adhere to each other when the organics adsorbed to the surface are dominated by petroleum hydrocarbons and when the residual mass on the resin increases.

6. FBA is more effective in treating TCE and PCE than lighter chlorinated VOCs, such as Freon 113 and 1,1,1-TCA. The differentiation is greater in the presence of petroleum hydrocarbons, which appear to preferentially adsorb to Ambersorb® 600 relative to the lighter chlorinated VOCs.

7. The system effluent was relatively noncorrosive, with test results yielding a design criterion for corrosion of 1 to 2 mils per year. The equipment fabrication design should include an additional stainless steel wall thickness of 20 mils to accommodate corrosion loss over 10 to 20 years of operation.

8.1.2 Process Efficiency Performance

The FBA demonstration results support the following conclusions regarding process efficiency performance issues:

1. The FBA demonstration recovered VOC contaminants as a recyclable product.

2. Increasing desorber retention time will reduce resin loading and likely enable sustainable operations to occur.

9.0 RECOMMENDATIONS

9.1 System Enhancements

The following system enhancements are recommended to provide long-term cost-effective treatment capabilities with FBA at sites exhibiting mixtures of chlorinated VOCs and fuel hydrocarbons.

1. Enlarge the desorber to maintain residual organic mass on the resin at less than 1,000 mg/kg TPHg by extending retention time in the desorber. A larger adsorption chamber would further improve the FBA test unit treatment performance by providing additional contact time between resin beads and the process gas stream.

2. Enlarge the adsorber to increase contact between the process gas and additional resin bead mass by extending retention time in the adsorber.

Evaluate the use of another form of adsorbent beads, such as bead activated carbon (BAC), instead of Ambersorb® 600 as the adsorbent material. Test results indicate that extended desorber and adsorber retention times (as recommended above) will improve FBA treatment efficiency for mixtures of petroleum hydrocarbons and solvents; however, additional testing is needed to evaluate whether recalcitrant petroleum hydrocarbons will still accumulate on Ambersorb® 600 over time, resulting in bead flow inconsistencies similar to those observed during this demonstration. If this is the case, BAC may provide an alternative adsorption medium that would not be susceptible to bead flow inconsistencies.

TABLES

10.0 REFERENCES

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Table 1. FBA Field Readings
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Date (M/D/Y)	Time (H:M)	SVE Blower Hour Meter (H)	Estimated Total Hours of Operation (H)	Estimated Total Hours of Well Operation (H)	FLOW DATA [a] Venturi Pressure Drop (in. H2O)	Vacuum Upstream of Venturi (in. H2O)	Inlet Temp. (F)	Flow Rate (scfm)	Ambient Air Data Temperature (F)	FBA Influent PID [d] (ppmv)	FBA Effluent PID [d] (ppmv)	Comments
7/16/97	13:40	4.0	4.0	4.0	1.80	21.5	80	100	---	---	---	Began well air extraction
7/17/97	9:35	6.2	6.2	6.2	1.40	23.0	64	90	72	534	29	
7/17/97	16:40	12.8	12.8	12.8	1.00	17.5	86	74	90	524	310	
7/18/97	4:10	24.3	24.3	24.3	---	---	---	---	---	---	---	Desorber Bead Level Alarm, moisture in bead transfer line.
7/21/97	17:10	25.1	25.1	25.1	1.90	22.5	107	101	---	507	55	Restarted Unit
7/22/97	7:00	42.0	42.0	42.0	---	---	---	---	---	---	---	Manual shutdown for SVE blower repairs.
7/22/97	16:30	42.5	42.5	42.5	1.10	21.0	95	77	---	491	172	Restarted Unit
7/22/97	18:00	44.8	44.8	44.8	---	---	---	---	---	---	---	Cat-Ox Unit Shutdown Alarm
7/23/97	8:35	45.0	45.0	45.0	1.50	25.0	71	93	68	472	196	Restarted Unit
7/23/97	9:00	45.4	45.4	45.4	1.40	26.0	72	89	---	436	195	
7/23/97	10:15	47.0	47.0	47.0	---	---	---	---	---	---	---	Desorber Bead Level Alarm
7/23/97	15:10	47.4	47.4	47.4	1.30	22.0	80	85	80	483	266	Restarted Unit
7/23/97	15:21	48.1	48.1	48.1	---	---	---	---	---	---	---	Manual shutdown due to clogging of beads
7/24/97	9:20	48.1	48.1	48.1	---	---	---	---	---	---	---	Restarted unit on ambient air
7/24/97	13:10	49.2	49.2	48.1	1.80	22.5	13	107	93	473	303	Well air extraction, manual shutdown of unit
7/29/97	9:15	49.2	49.2	48.1	---	---	---	---	---	---	---	Restarted unit on ambient air
7/29/97	10:15	51.1	51.1	48.1	1.90	25.0	78	104	---	443	188	Well air extraction
7/29/97	11:15	52	52.0	49.0	1.60	25.0	80	95	---	520	102	
7/29/97	14:20	55	55.0	52.0	---	---	---	---	---	---	---	Desorber bead level alarm, blown fuse.
7/30/97	7:40	55.0	55.0	52.0	---	---	---	---	---	---	---	Restarted unit on ambient air
7/30/97	11:05	56.5	56.5	52.0	0.90	19.0	78	71	---	492	85	Well air extraction
7/30/97	16:15	61.6	61.6	57.1	---	---	---	---	---	---	---	Manual shutdown due to clogging of beads and to install ball valve
7/30/97	17:00	62.2	62.2	57.1	0.90	20.0	82	71	---	476	167	Well air extraction
7/30/97	23:00	68.0	68.0	62.9	---	---	---	---	---	---	---	Desorber bead level alarm
7/31/97	16:20	68.6	68.6	62.9	1.50	25.0	89	91	---	519	272	Well air extraction
8/1/97	16:30	87.4	87.4	81.7	0.80	20.0	93	66	---	461	153	
8/4/97	10 45	154 0	154.0	148.3	---	---	---	---	---	---	---	Manual shutdown due to clogging of beads
8/4/97	16 45	154 0	154.0	148.3	---	---	---	---	---	---	---	Restarted unit on well air

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Sacramento, California

Date (M/D/Y)	Time (H:M)	SVE Blower Hour Meter (H)	Estimated Total Hours of Operation (H)	Estimated Total Hours of Well Operation (H)	FLOW DATA [a]				Ambient Air Data Temperature (F)	FBA Inffluent PID [d] (ppmv)	FBA Effluent PID [d] (ppmv)	Comments
					Venturi Pressure Drop (in. H2O)	Vacuum Upstream of Venturi (in. H2O)	Inlet Temp. (F)	Flow Rate (scfm)				
8/4/97	18:00	155.1	155.1	149.4	—	—	—	—	—	—	—	Desorber bead level alarm
8/5/97	7:15	155.1	155.1	149.4	—	—	—	—	—	—	—	Restarted unit on ambient air
8/5/97	7:50	155.6	155.6	149.4	—	—	—	—	—	—	—	Desorber bead level alarm
8/5/97	15:50	155.8	155.8	149.4	—	—	—	—	—	—	—	Restarted unit on ambient air, cleaned adsorber trays
8/6/97	0:50	164.8	164.8	149.4	—	—	—	—	—	—	—	Nitrogen flow sensor alarm, SVE blower bearing failure
8/6/97	9:30	164.8	164.8	149.4	—	—	—	—	—	—	—	Restarted unit on ambient air, replaced SVE blower bearing
8/6/97	13:50	169.1	169.1	149.4	—	—	—	—	—	—	—	Restarted well air extraction
8/6/97	14:05	169.3	169.3	149.6	0.70	16.0	107	61	—	533	337	
8/6/97	14:30	169.8	169.8	150.1	1.80	35.0	104	100	—	605	138	VES Blower pulley adjustment backed-off overnight
8/7/97	8:05	187.3	187.3	167.6	1.00	21.0	96	74	—	500	216	
8/7/97	9:47	189.0	189.0	169.3	—	—	—	—	—	—	—	Desorber bead level alarm
8/7/97	11:25	189.0	189.0	169.3	—	—	—	—	—	—	—	Restarted well air extraction
8/7/97	13:00	190.5	190.5	170.8	1.00	20.0	104	73	100	491	305	
8/8/97	6:40	208.2	208.2	188.5	—	—	—	—	—	—	—	Desorber bead level alarm
8/8/97	8:15	208.2	208.2	188.5	—	—	—	—	—	—	—	Restarted unit on ambient air
8/8/97	9:45	209.7	209.7	188.5	—	—	—	—	—	—	—	Restarted well air extraction
8/8/97	11:45	211.6	211.6	190.4	1.00	21.0	95	74	90	563	431	Collected day-5 samples
8/8/97	22:30	222.1	222.1	200.9	—	—	—	—	—	—	—	Desorber bead level alarm
8/11/97	11:55	222.6	222.6	200.9	2.50	30.0	84	119	—	—	—	Restarted unit on ambient air
8/12/97	7:45	242.6	242.6	200.9	—	—	—	—	—	—	—	Manual shutdown due to clogging of beads
8/14/97	7:40	242.6	242.6	200.9	1.80	23.0	69	101	—	—	—	Restarted unit on well air to allow URS sampling
8/14/97	8:20	243.3	243.3	201.6	—	—	—	—	—	—	—	Manual shutdown
8/14/97	14:45	243.3	243.3	201.6	—	—	—	—	—	—	—	Restarted unit on well air to perform humidity testing, no bead flow
8/15/97	6:15	258.3	258.3	216.6	1.20	22.0	66	83	—	—	—	Performed humidity test, no bead flow
8/15/97	6:30	258.6	258.6	216.9	—	—	—	—	—	—	—	Manual shutdown
8/29/97	13:51	258.6	258.6	216.9	—	—	—	—	—	—	—	Restarted unit on well air to perform bead flow test
8/29/97	14:54	259.6	259.6	217.9	1.20	35.0	104	81	—	563	338	Heat exchanger and misters off line

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McClellan Air Force Base
Sacramento, California

Date (M/D/Y)	Time (H:M)	SVE Blower Hour Meter (H)	Estimated Total Hours of Operation (H)	Estimated Total Hours of Well Operation (H)	FLOW DATA [a] Venturi Pressure Drop (in. H2O)	Vacuum Upstream of Venturi (in. H2O)	Inlet Temp. (F)	Flow Rate (scfm)	Ambient Air Data Temperature (F)	FBA Inffluent PID [d] (ppmv)	FBA Effluent PID [d] (ppmv)	Comments
8/29/97	15:10	260.2	260.2	218.5	—	—	—	—	—	—	—	Manual shutdown
12/1/97	13:10	260.2	260.2	218.5	—	—	—	—	—	—	—	Restarted FBAS without SVE blower to desorb resin
12/2/97	7:35	260.2	260.2	218.5	—	—	—	—	—	—	—	Manual shutdown
12/2/97	16:00	260.2	260.2	218.5	—	—	—	—	—	—	—	Restarted FBAS without SVE blower or nitrogen
12/3/97	8:40	260.3	260.3	218.5	—	—	—	—	—	—	—	Restarted unit on ambient air
12/3/97	8:50	260.5	260.5	218.7	0.90	20.0	61	72	—	—	—	Restarted well air extraction
12/3/97	9:05	260.7	260.7	218.9	0.90	20.0	61	72	—	487	67	Collected initial samples
12/3/97	9:30	261.1	261.1	219.3	0.90	20.0	61	72	57	537	51	
12/3/97	9:35	261.3	261.3	219.5	—	—	—	—	—	—	—	Desorber bead level alarm
12/3/97	10:00	261.3	261.3	219.5	0.70	26.0	67	64	—	—	—	Restarted well air extraction
12/3/97	10:25	261.7	261.7	219.9	0.70	26.0	67	64	—	539	182	
12/3/97	11:05	262.4	262.4	220.6	0.70	26.0	67	64	—	570	378	
12/3/97	11:08	262.4	262.4	220.6	—	—	—	—	—	—	—	Desorber bead level alarm
12/3/97	13:30	262.4	262.4	220.6	0.90	8.0	64	71	—	—	—	Restarted well air extraction
12/3/97	13:45	262.7	262.7	220.9	0.90	8.0	64	71	—	538	188	Collected closeout samples
12/3/97	13:50	262.7	262.7	220.9	—	—	—	—	—	—	—	Manual shutdown, collected resin and condensate samples

— = not applicable/not measured
F = degrees Fahrenheit
H = hours
H:M = hours/ minutes
ID = identification
in. H2O = inches of water column
M/D/Y = month/day/year
PID = field reading with photoionization device (Microtip, Model MP-1000)
ppmv = parts per million by volume
scfm = standard cubic feet per minute (14.7 psia at 60 F)
SVE = soil vapor extraction
Temp. = temperature
VES = vapor extraction system
FBAS = fluidized bed adsorption system

Table 2. Sampling Event Schedule
Fluidized Bed Adsorption PRDA Test
McClellan Air Force Base, IC-31
Sacramento, California

Parameter	Method	Data Quality Level	Sample Location	SAMPLING EVENTS						
				Startup		Test Phase				
				Day 1	Day 5	Hour 0 Test Start	Hour 0.5	Hour 1	Hour 1.5	Hour 2 Test End
VAPORS & EMISSIONS										
Flow	—	Screening	FBAI	1	1	1	1	1	1	1
Temperature and Pressure	—	Screening	FBAI	1	1	1	1	1	1	1
			FBAE	1	1	1	1	1	1	1
Total VOCs	PID	Screening	FBAI	1	1	1	1	1	1	1
			FBAE	1	1	1	1	1	1	1
Halogenated and Aromatic VOCs and NMOCs	EPA 8021 and E18 modified	Definitive	FBAI	1	1	1	—	—	—	1
			FBAE	—	1	1	—	—	—	1
			QC Samples	—	FD	FD	—	—	—	—
VOCs	Method TO-14 plus TICs and TVH	Definitive	FBAI	—	1	1	—	—	—	1
			FBAE	—	1	1	—	—	—	1
			QC Samples	—	FB	—	—	—	—	—
Corrosive Gasses	CORROSOMETERÒ	Definitive	Stack			Continuous Monitoring				
WATER CONDENSATE										
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Condensate Storage Drum	—	—	—	—	—	—	1
TPH	EPA 3510/8015 mod	Definitive	Condensate Storage Drum	—	—	—	—	—	—	1
Acidity	EPA 9040	Definitive	Condensate Storage Drum	—	—	—	—	—	—	1
PRODUCT CONDENSATE										
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Condensate Storage Drum	—	—	—	—	—	—	1
TPH	EPA 3510/8015 mod	Definitive	Condensate Storage Drum	—	—	—	—	—	—	1
RESIN BEADS										
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Adsorber	—	—	1	—	—	—	1
			Desorber	1		1	—	—	—	1
TPHp	EPA 5030/8015 mod	Definitive	Adsorber	—	—	1	—	—	—	1
			Desorber	1	—	1	—	—	—	1
TPHe	EPA 3550/8015 mod	Definitive	Adsorber	—	—	1	—	—	—	1
			Desorber	1	—	1	—	—	—	1

FBAE = Fluidized Bed Adsorption Effluent
FBAI = Fluidized Bed Adsorption Influent
FD = field duplicate
NMOCs = non-methane organic compounds
PID = photoionization device
QC = quality control
TICS = tentatively identified compounds
TPH = total petroleum hydrocarbons
TPHp = TPH using purgable recovery method for VOCs
TPHe = TPH using extractable recovery method for SOCs
TVH = total volatile hydrocarbons
VOCs = volatile organic compounds
SOCs = semi-volatile organic compounds

Table 3. Vapor VOC Concentrations - TO-14
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Sampling Event	Location	Date (M/D/Y)	Sample ID	Target Chlorinated VOCs												Total Chlorinated VOCs (ppmv)	TVH [1] (ppmv)	Field PID (ppmv)
				1,1-DCE (ppmv)	Freon 113 (ppmv)	1,1-DCA (ppmv)	cis-DCE (ppmv)	1,1,1-TCA (ppmv)	1,2-DCA (ppmv)	TCE (ppmv)	Chloroform (ppmv)	CH_2Cl_2 (ppmv)	CCl_4 (ppmv)	1,1,2-TCA (ppmv)	PCE (ppmv)			
Day 5 Startup	Influent	8/8/97	FBAI-03	1.8	0.18	3.1	2.4	4.7	ND (0.13)	22	1.4	0.24	0.16	ND (0.13)	0.8	37	1200	563
	Effluent	8/8/97	FBAE-02	1.3	0.18	2.1	1.2	3.9	ND (0.04)	7	0.87	0.27	0.15	ND (0.04)	0.22	17	710	431
	Field Blank	8/8/97	FBAB-01	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	ND (0.042)	0.0	ND	---
Start Test	Influent	12/3/97	FBAI-104	0.96	0.097	2.0	1.4	2.6	ND (0.077)	13	0.82	0.17	ND (0.077)	ND (0.077)	0.37	21	380	487
	Effluent	12/3/97	FBAE-104	0.19	0.056	0.36	0.18	0.87	ND (0.018)	1.2	0.13	0.04	ND (0.018)	0.21	0.033	3.3	66	67
End Test	Influent	12/3/97	FBAI-105	1.1	0.096	2.2	1.5	2.9	ND (0.095)	16	0.92	0.18	ND (0.095)	1.2	0.45	27	390	538
	Effluent	12/3/97	FBAE-105	0.46	0.093	0.95	0.54	1.9	ND (0.038)	4.7	0.38	0.083	0.61	0.66	0.13	10.5	260	188

Notes:

— = not applicable/not measured
EPA = Environmental Protection Agency
ID = identification
M/D/Y = month/day/year
ND ( ) = not detected, detection limit indicated in paranthesis
PID = photoionization detector
ppmv = parts per million by volume
ASTM Analysis method TO-14 & TICS
[1] = Total of target compounds
Total Chlorinated VOCs = Summation of all detected target chlorinated VOCs, rounded to two significant figures.
VOCs = volatile organic compounds
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1-DCE = 1,1-dichloroethene
cis-DCE = cis-1,2-dichloroethene
trans-DCE = trans-1,2-dichloroethene
Freon 113 = 1,1,2-trichloro-1,2,2-trifluoroethane
CCl_4 = carbon tetrachloride
CH_2Cl_2 = methylene chloride
TIC = tentatively identified compounds
TVH = laboratory result of total volatile compounds

Table 4. Vapor VOC Concentrations - EPA 8021 and E18
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Sampling Event	Location	Date (M/D/Y)	Sample ID	Target Chlorinated VOCs											Total Chlorinated VOCs (ppmv)	NMOCs (ppmv)	Field PID (ppmv)
				1,1-DCE (ppmv)	Freon 113 (ppmv)	1,1-DCA (ppmv)	cis-DCE (ppmv)	1,1,1-TCA (ppmv)	1,2-DCA (ppmv)	TCE (ppmv)	Chloroform (ppmv)	CH_2Cl_2 (ppmv)	CCl_4 (ppmv)	PCE (ppmv)			
Day 1 Startup	Influent	7/17/97	FBAI-01	2.5	ND (0.2)	3.6	2.8	5.1	0.16	20	2	0.19	0.42	1.1	38	4200	534
	Effluent	7/17/97	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29
Day 5 Startup	Influent	8/8/97	FBAI-02	2.1	ND (0.2)	3.5	2.9	4.8	0.088	21	1.8	0.16	0.35	0.93	38	3700	563
	Duplicate	8/8/97	FBAID-01	2.0	ND (0.2)	3.3	2.8	4.7	0.082	20	1.8	0.15	0.34	0.92	36	1200	563
	Effluent	8/8/97	FBAE-01	1.4	ND (0.2)	1.9	1.3	3.8	ND (0.06)	7.6	1.1	ND (0.06)	0.23	0.27	18	2400	431
Start Test	Influent	12/3/97	FBAI101	11	0.25	2.2	1.7	2.6	0.08	11	1	0.13	0.17	0.47	31	2700	487
	Effluent	12/3/97	FBAE101	0.25	ND (0.1)	0.32	0.16	0.84	ND (0.03)	1.2	0.19	ND (0.03)	0.044	0.054	3.1	480	67
	Duplicate	12/3/97	FBAED101	0.24	ND (0.1)	0.31	0.15	0.82	ND (0.03)	1.2	0.18	ND (0.03)	0.043	0.052	3.0	440	67
End Test	Influent	12/3/97	FBAI103	1.2	ND (0.1)	2	1.6	2.4	0.075	11	0.94	0.12	0.15	0.43	20	2300	538
	Effluent	12/3/97	FBAE103	0.58	ND (0.1)	0.79	0.48	1.5	ND (0.03)	3.6	0.39	ND (0.03)	0.083	0.13	7.6	1400	188

Notes:

— = not applicable/not measured
EPA = Environmental Protection Agency
ID = identification
M/D/Y = month/day/year
ND ( )= not detected, detection limit is included in paratheseis
NMOCs = lab analysis of non-methane organic compounds
ppmv = parts per million by volume
All analyzed by EPA or ASTM Method 8021 & E18
Total Chlorinated VOCs = Summation of all detected target chlorinated VOCs, rounded to two significant figures.

PID = photoionization detector
VOCs = volatile organic compounds
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1-DCE = 1,1-dichloroethene
cis-DCE = cis-1,2-dichloroethene
CCl_4 = carbon tatrachloride

trans-DCE = trans-1,2-dichloroethene
Freon 113 = 1,1,2-trichloro-1,2,2-trifluoroethane
PCE = tetrachloroethene
1,1,1-TCA = 1,1,1-trichloroethane
TCE = trichloroethene
CH_2Cl_2 = methylene chloride

Table 5. Vapor VOC Destruction and Removal Efficiencies -
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Sampling Event	Date (M/D/Y)	EPA or ASTM Analysis Method	Destruction and Removal Efficiency (DRE)											Total Chlorinated VOCs (ppmv)	NMOCs (ppmv)	Field PID (ppmv)
			1,1-DCE (ppmv)	Freon 113 (ppmv)	1,1-DCA (ppmv)	cis-DCE (ppmv)	1,1,1-TCA (ppmv)	1,2-DCA (ppmv)	CCl_4 (ppmv)	Chloroform (ppmv)	CH_2Cl_2 (ppmv)	TCE (ppmv)	PCE (ppmv)			
Day 1 Startup	7/17/97	---	-	-	-	-	-	-	-	-	-	-	-	-	-	95%
Day 5 Startup	8/8/97	8021 & E18	33%	-	46%	55%	21%	-	34%	39%	34%	64%	71%	53%	38%	23%
Duplicate	8/8/97	8021 & E18	30%	-	42%	54%	19%	-	32%	39%	32%	62%	71%	51%	-100%	23%
	8/8/97	TO-14	28%	0%	32%	50%	17%	-	6%	38%	-13%	68%	73%	55%	41%	23%
Start Test	12/3/97	8021 & E18	98%	-	85%	91%	68%	-	74%	81%	-	89%	89%	96%	82%	86%
Duplicate	12/3/97	8021 & E18	98%	-	86%	91%	68%	-	75%	82%	-	89%	89%	96%	84%	86%
	12/3/97	TO-14	80%	42%	82%	87%	67%	-	-	84%	76%	91%	91%	85%	83%	86%
End Test	12/3/97	8021 & E18	52%	-	61%	70%	38%	-	45%	59%	45%	67%	70%	62%	39%	65%
	12/3/97	TO-14	58%	3%	57%	64%	34%	-	-	59%	54%	71%	71%	63%	33%	65%

Notes:

--- = not applicable/not measured
ASTM = American Society for Testing and Materials
quality control check.
EPA = Environmental Protection Agency
ID = identification
M/D/Y = month/day/year
NMOCs = non-methane organic compounds
ppmv = parts per million by volume
No DREs were calculated for ND's.
PID = photoionization detector
VOCs = volatile organic compounds
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1-DCE = 1,1-dichloroethene
cis-DCE = cis-1,2-dichloroethene
trans-DCE = trans-1,2-dichloroethene
Freon 113 = 1,1,2-trichloro-1,2,2-trifluoroethane
PCE = tetrachloroethene
1,1,1-TCA = 1,1,1-trichloroethane
TCE = trichloroethene
CCl_4 = carbon tetrachloride
CH_2Cl_2 = methylene chloride

Table 6. Resin VOC Concentrations - EPA 8240 m8015
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Sampling Event	Location	Date (M/D/Y)	Sample ID	Target Chlorinated VOCs										Total Chlorinated VOCs (mg/kg)	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-O (mg/kg)
				1,1-DCE (mg/kg)	Methylene Chloride (mg/kg)	1,1-DCA (mg/kg)	1,2-DCE Total (mg/kg)	Chloroform (mg/kg)	1,1,1-TCA (mg/kg)	Carbon Tetrachloride (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	PCE (mg/kg)				
Day 1 Startup	Virgin Resin	7/16/97	RESIN-01	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	0.0	ND (4.0)	8	NA
Day 5 Startup	Adsorb	8/8/97	ADSORB-01	ND (50)	ND (50)	120	72	92	ND (50)	ND (50)	ND (50)	920	ND (50)	1200	15000	ND (100)	ND(200)
Test End	Adsorb	12/3/97	ADSORB-102	ND(12)	ND(12)	45	28	ND(12)	ND(12)	ND(12)	ND(12)	340	28	440	10000	NA	NA
Day 5 Startup	Desorb - 1 cycle	8/8/97	DESORB-03	ND (50)	ND (50)	86	56	66	ND (50)	ND (50)	ND (50)	800	ND (50)	1000	9700	ND (50)	ND (50)
Start Test	Desorb -9 Cycles	12/3/97	ADSORB-101**	ND (1.2)	ND (1.2)	8	4.2	3.7	ND (1.2)	ND (1.2)	ND (1.2)	160	14	190	730	NA	NA
End Test	Desorb-1 Cycle	12/3/97	DESORB-101	ND (1.2)	ND (1.2)	3.8	2.6	2.6	ND (1.2)	ND (1.2)	ND (1.2)	130	15	150	790	NA	NA
Final Desorb	3 Cycles	12/13/97	ADSORB-103**	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	ND(12)	100	13	110	2200	NA	NA

Notes:

— = not applicable/not measured
ASTM = American Society for Testing and Materials
EPA = Environmental Protection Agency
ID = identification
M/D/Y = month/day/year
ND = not detected
NT = not tested
ppmv = parts per million by volume
TICs = tentatively identified compounds
VOCs = volatile organic compounds
TPH_g= Total petroleum hydrocarbons as gas
TPH_d = TPH diesel
TPH_o= TPH motor oil
** = these samples were collected from the adsorb location during a time when no contaminants were present.

1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1-DCE = 1,1-dichloroethene
cis-DCE = cis-1,2-dichloroethene
trans-DCE = trans-1,2-dichloroethene
Freon 113 = 1,1,2-trichloro-1,2,2-trifluoroethane
PCE = tetrachloroethene
1,1,1-TCA = 1,1,1-trichloroethane
TCE = trichloroethene
Total Chlorinated VOCs = Summation of all detected target chlorinated VOCs, rounded to two significant figures.

Table 7. Condensate VOC Concentrations - EPA 8240 m8015
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Sampling Event	Location	Date (M/D/Y)	Sample ID	Taget Chlorinated VOCs								Total Chlorinated VOCs (mg/kg)	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-MO (mg/kg)	pH
				1,1-DCE (mg/kg)	1,2-DCE (mg/kg)	1,1-DCA (mg/kg)	1,1,1-TCA (mg/kg)	1,2-DCA (mg/kg)	TCE (mg/kg)	Carbon Tetrachloride (mg/kg)	PCE (mg/kg)					
Test End	Condensate Drum	12/3/97	PCOND-101	9.7	260	190	50	ND (1.2)	7800	ND (1.2)	460	8800	1400	ND (5000)	ND (5000)	---
Test End	Condensate Drum	12/3/97	PCOND-102	ND (500)	ND (500)	ND (500)	ND (500)	ND (500)	9300	ND (500)	1100	10000	270000	ND (5000)	ND (5000)	6.48

Notes:

--- = not applicable/not measured
EPA = Environmental Protection Agency
ID = identification
M/D/Y = month/day/year
ND = not detected
ppmv = parts per million by volume
VOCs = volatile organic compounds
1,1-DCA = 1,1-dichloroethane
1,2-DCB = 1,2-dichlorobenzene
1,1-DCE = 1,1-dichloroethene
cis-DCE = cis-1,2-dichloroethene
trans-DCE = trans-1,2-dichloroethene
Freon 113 = 1,1,2-trichloro-1,2,2-trifluoroethane
PCE = tetrachloroethene
1,1,1-TCA = 1,1,1-trichloroethane
TCE = trichloroethene

Table 8. Relative Humidity (RH) and Temperature Readings
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Date	Hour	Aftercooler		Misters	Ambient Conditions		Sampling Location									
							Well Air		Blower Effluent		Aftercooler Effluent		Water K/O Effluent		FBAS Effleunt	
		On/Off	In Line/Off Line	On/Off	%RH	Temp. (°F)	%RH	Temp. (°F)	%RH	Temp. (°F)	%RH	Temp. (°F)	%RH	Temp. (°F)	%RH	Temp. (°F)
8/14/97	15:10	On	In Line	On	32	97	40	100	30	136	99	78	73	90	49	101
	15:40	Off	Off Line	Off	30	100	43	104	30	139	30	134	35	119	38	112
8/15/97	5:00	Off	Off Line	Off	70	64	88	65	53	98	58	94	83	81	95	74
	5:30	Off	In Line	Off	75	60	56	65	58	97	60	84	90	74	85	71
	5:55	On	In Line	Off	84	61	26	64	56	99	82	63	63	62	90	66
	6:15	On	In Line	On	85	59	86	63	53	100	92	61	95	62	92	64

Notes:

RH = Relative Humidity
Temp. = Temperature
KO = Knock out
FBAS = Fluidized Bed Adsorption System

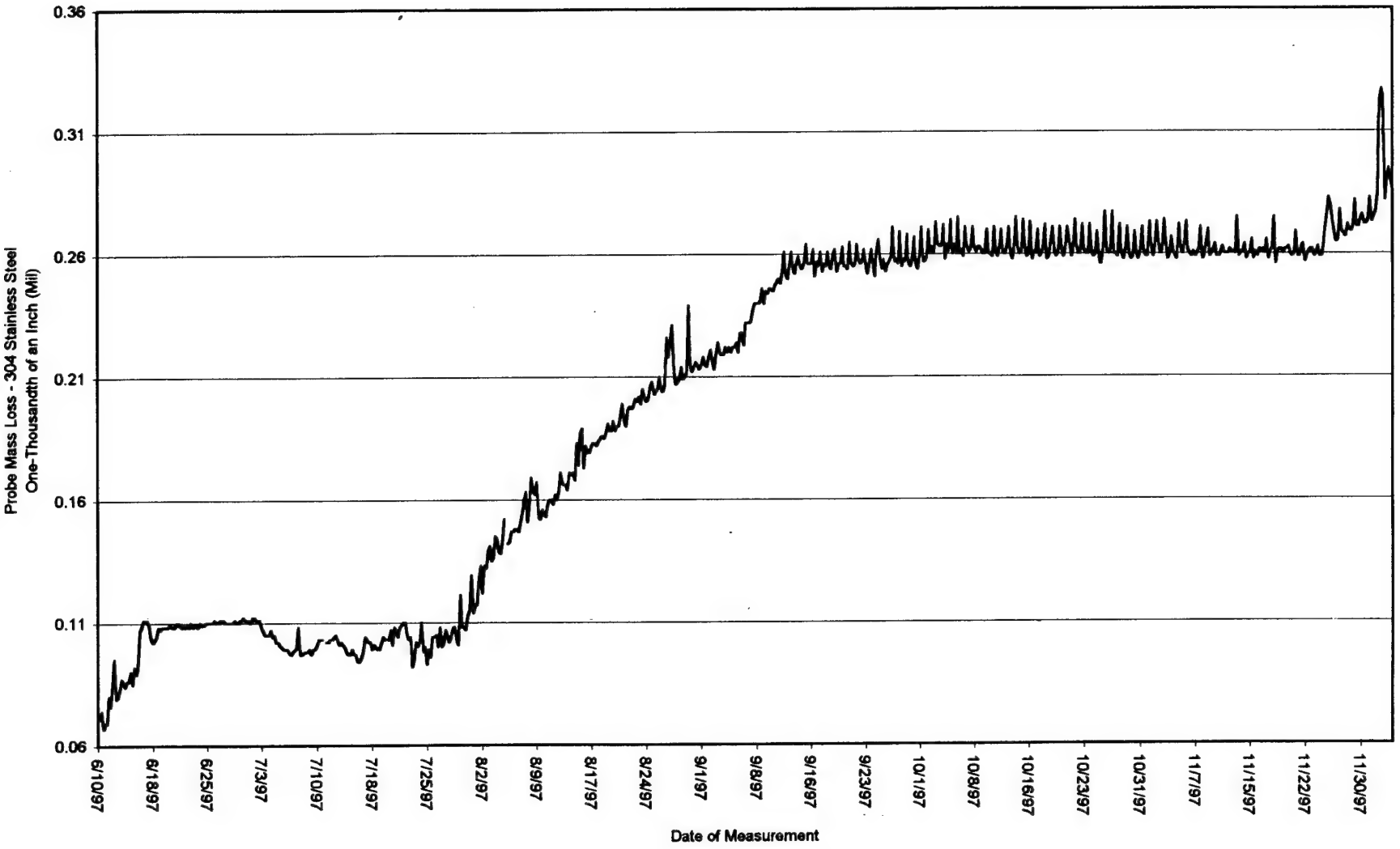
Table 9. Utilities Consumption
PRDA Test: "Fluidized Bed Adsorption"
McClellan Air Force Base
Sacramento, California

Date (M/D/Y)	Time (H:M)	SVE Blower Hour Meter (H)	Estimated Total Hours of Operation (H)	Operational Parameters				Utility Usage				
				Nitrogen Flow (cfm)	Tap Water Flow (gpm)	FBAS Current Draw (Amps)	SVE Blower Current Draw (Amps)	Total Nitrogen (cf)	Tap Water (gallons)	FBAS Electrical (kilowatt-hour)	SVE Blower Electrical (kilowatt-hour)	Total Electrical (kilowatt-hour)
7/16/97	13:40	4.0	4.0	1.50	2.0	30	23	360	480	29	22	51
7/17/97	9:35	6.2	6.2	1.50	2.0	31	21	558	744	45	33	78
7/17/97	16:40	12.8	12.8	1.50	2.0	31	21	1152	1536	94	66	161
7/21/97	17:10	25.1	25.1	1.50	2.0	30	25	2259	3012	183	140	323
7/22/97	16:30	42.0	42.0	1.50	2.0	28	21	3780	5040	296	225	522
7/23/97	8:35	45.0	45.0	1.50	2.0	21	22	4050	5400	312	241	553
7/23/97	15:10	47.4	47.4	1.50	2.0	30	22	4266	5688	329	254	583
7/24/97	13:10	49.2	49.2	1.50	1.0	17	23	4428	5796	336	264	600
7/29/97	10:15	51.1	51.1	1.50	2.0	24	20	4599	6024	347	273	620
7/30/97	11:05	56.6	56.6	1.50	2.0	28	16	5094	6684	384	294	678
7/31/97	16:20	68.6	68.6	1.50	2.0	30	21	6174	8124	470	355	825
8/6/97	14:05	169.3	169.3	1.50	2.0	30	17	15237	20208	1195	765	1961
8/7/97	8:05	187.3	187.3	1.50	2.0	28	18	16857	22368	1316	843	2160
8/7/97	13:00	190.5	190.5	1.50	2.0	32	20	17145	22752	1341	859	2200
8/8/97	11:45	211.6	211.6	1.50	2.0	30	18	19044	25284	1493	950	2443
12/3/97	9:30	262.7	262.7	1.50	2.0	23	14	23643	31416	1775	1121	2896

Notes:
cfm = cubic feet per minute
gpm = gallons per minute
M/D/Y = month day and year
H:M = hours and minutes
H = hours
FBAS = fluidized bed adsorption system
SVE = soil vapor extraction

FIGURE

Figure 1. Probe Mass Loss (6/10/97 to 12/4/97)
Fluidized Bed Assorbtion PRDA Test
McClellen Air Force Base, IC-31
Sacramento, California



APPENDIX A

WORK IMPLEMENTATION PLAN ATTACHMENTS

Table 5. Sample Containers Holding Times
Fluidized Bed Adsorption PRDA Test
Work Implementation Plan
McClellan Air Force Base, IC-31
Sacramento, California

Parameter	Analytical Method	Sample Container	Holding Time	Preservation
VAPORS & EMISSIONS				
Halogenated and Aromatic VOCs and NMOCs	8021 and E18 modified	Tedlar (R) bag	24 hours	None
VOCs	Method TO-14	SUMMA (R) Canister	14 days	None
Nitrogen Oxides	CARB 100	Continuous Monitor	As collected	None
WATER CONDENSATE				
Halogenated and Aromatic VOCs	EPA 8240	40-ml VOA Vial (3)	14 days	None
TPH	EPA 3510/8015 modified	Amber Liter (2)	7 days	None
Acidity	EPA 9040	Poly 0.5 Liter (2)	24 hours	None
PRODUCT CONDENSATE				
Halogenated and Aromatic VOCs	EPA 8240	40-ml VOA Vial (3)	14 days	None
TPH	EPA 3510/8015 modified	Amber Liter (2)	7 days	None
RESIN BEADS				
Halogenated and Aromatic VOCs	EPA 8240	8-oz Glass Jar (2)	14 days	None
TPH purgable	EPA 5030/8015 modified	8-oz Glass Jar (2)	14 days	None
TPH extractable	EPA 3550/8015 modified	8-oz Glass Jar (2)	14 days	None

Table 6. Rationale for Vapor and Emissions Analytical Methods
Fluidized Bed Adsorption PRDA Test
Work Implementation Plan
McClellan Air Force Base, IC-31
Sacramento, California

Phase	Analytical Method	Data Quality Level		Rationale Based Upon Data Use
		EPA DQO Guidance	Basewide RI/FS QAPP	
Startup	Total VOCs (Field PID readings)	Screening	Level I	1) Immediate TAT to support FBA optimization.
	Halogenated and Aromatic VOCs and NMOCs (8021 and E18 modified)	Screening	Level II	1) Short TAT to support FBA optimization. 2) Provides some speciation and correlation for PID readings
Test	Total VOCs (Field PID readings)	Screening	Level I	1) Immediate TAT to monitor any changes in FBA system
	Halogenated and Aromatic VOCs and NMOCs (8021 and E18 modified)	Screening	Level II	1) Short TAT to monitor changes in FBA system 2) Provides some speciation and correlation for PID readings 3) Verification samples will also be collected and analyzed by Method TO-14 for more definitive VOC emissions.
	VOCs (Method TO-14)	Definitive	Level III	1) Standard method for producing high quality data for total and speciated emissions. 2) Can tentatively identify intermediate compounds or byproducts.
	Nitrogen Oxides (CARB 100)	Definitive	Level III	Monitor Nitrogen Oxides emission as a criteria pollutant using acceptable CARB method.

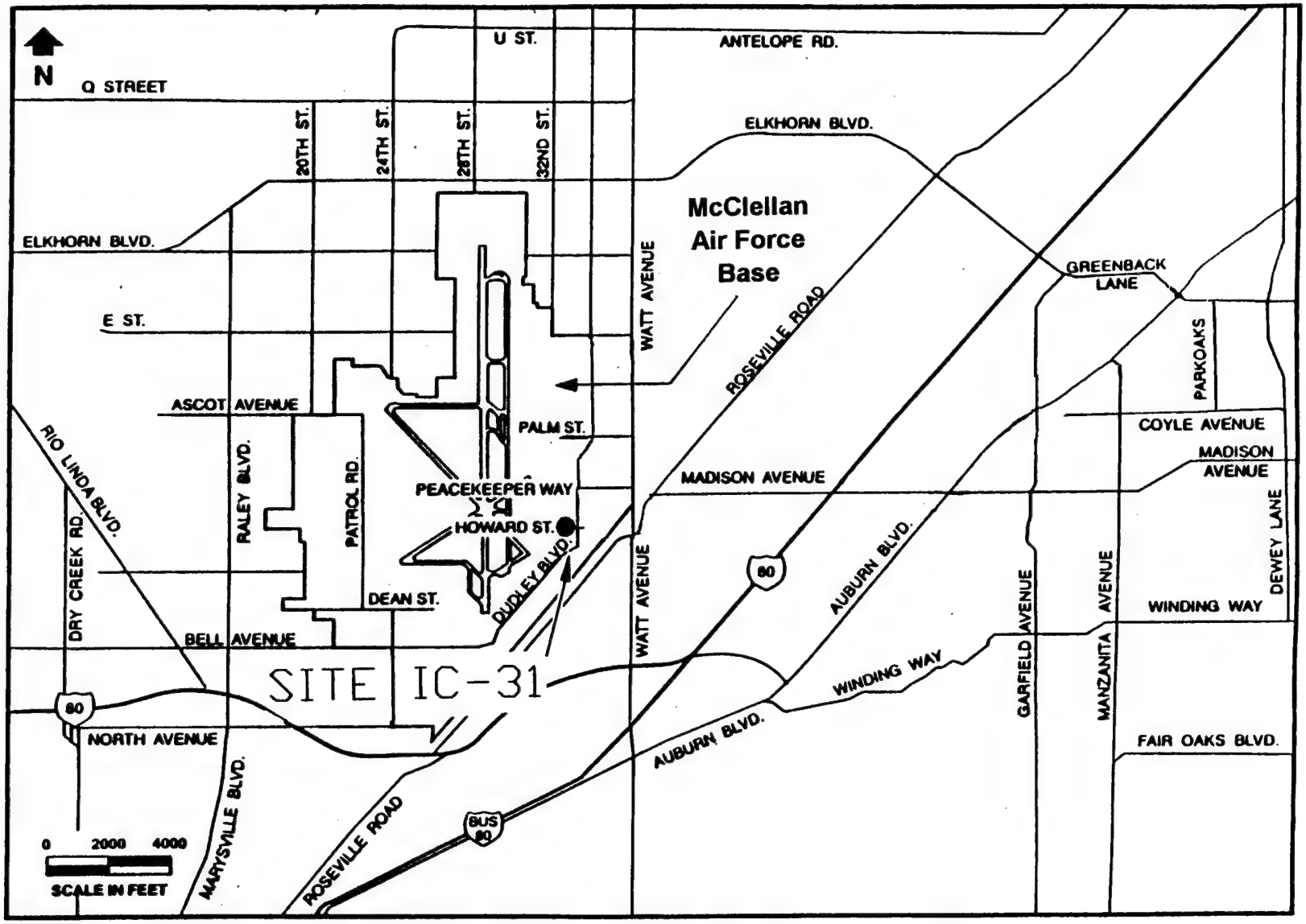
EPA DQO Guidance = 1993 EPA Data Quality Objectives Interim Final Guidance

Table 7. Analytical Data Quality Objectives
Fluidized Bed Adsorption PRDA Test
Work Implementation Plan
McClellan Air Force Base, IC-31
Sacramento, California

Analysis	Reference Method	Basewide RI/FS QAPP Table References for Applicable Analytical Data Quality Objectives
VAPORS & EMISSIONS		
VOCs	EPA Method 8021	4-5a, 4-5b, and 10-5
NMOCs	Modified Method E18	10-32
VOCs	EPA Method TO-14	4-2 and 10-27
Nitrogen Oxides	CARB 100	---
WATER CONDENSATE		
VOCs	EPA Method 8240[a]	4-11 and 10-11
TPHp	EPA 5030/8015 modified	4-6 and 10-6
TPHe	EPA 3550/8015 modified	4-7 and 10-7
Acidity	EPA Method 9040	---
PRODUCT CONDENSATE		
VOCs	EPA Method 8240[a]	4-11 and 10-11
TPHp	EPA 5030/8015 modified	4-6 and 10-6
TPHe	EPA 3550/8015 modified	4-7 and 10-7
RESIN BEADS		
VOCs	EPA Method 8240[a]	4-11 and 10-11
TPHp	EPA 5030/8015 modified	4-6 and 10-6
TPHe	EPA 3550/8015 modified	4-7 and 10-7

All referenced tables are from the Basewide Remedial Investigation/Feasibility Study Quality Assurance Project Plan dated April 1997

Notes: --- = not applicable
VOCs = volatile organic compound
NMOCs = non-methane organic compound
CARB = California Air Resource Board
EPA = U.S. Environmental Protection Agency
TO = toxic organics
TPHp = TPH using purgable recovery method
TPHe = TPH using extractable recovery method
[a] = Method 8240 has been replaced by Method 8260A. Collected samples will be analyzed by Method 8260A with applicable data quality objectives as specified in the Basewide RI/FS QAPP.



Harding Lawson Associates
Engineering and
Environmental Services

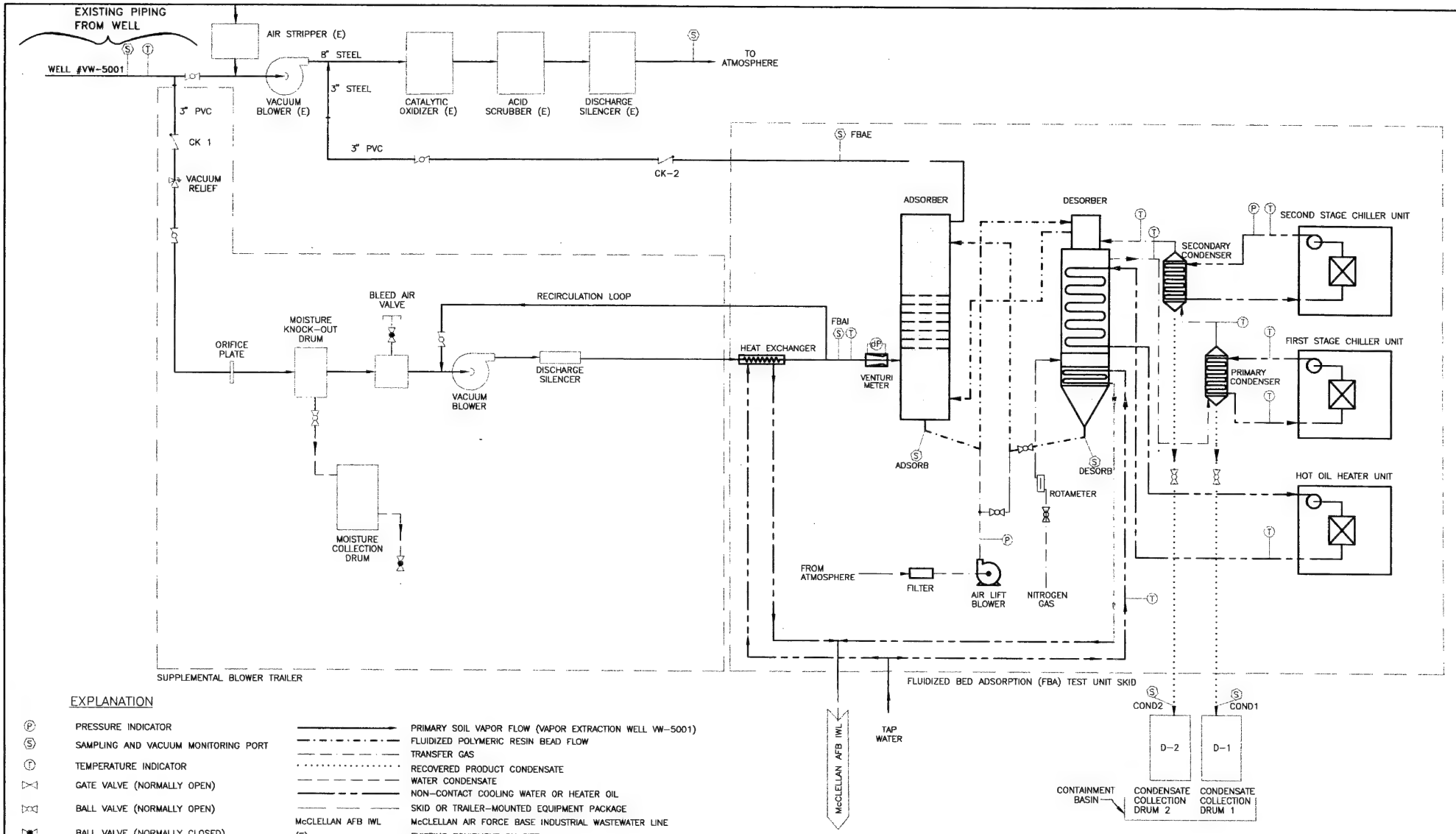
Site Map

Work Implementation Plan
McClellan Air Force Base
Sacramento, California

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TAG	37478.14		2/97	

HDSP 1.0
19970226.1026



EXPLANATION

- (P) PRESSURE INDICATOR
- (S) SAMPLING AND VACUUM MONITORING PORT
- (T) TEMPERATURE INDICATOR
- GATE VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE (NORMALLY OPEN)
- CHECK VALVE

- PRIMARY SOIL VAPOR FLOW (VAPOR EXTRACTION WELL VW-5001)
- FLUIDIZED POLYMERIC RESIN BEAD FLOW
- TRANSFER GAS
- RECOVERED PRODUCT CONDENSATE
- WATER CONDENSATE
- NON-CONTACT COOLING WATER OR HEATER OIL
- SKID OR TRAILER-MOUNTED EQUIPMENT PACKAGE
- McCLELLAN AFB IWL — McCLELLAN AIR FORCE BASE INDUSTRIAL WASTEWATER LINE
- (E) — EXISTING EQUIPMENT ON SITE

NO.	DATE	REVISIONS	BY	CHK
A	5/97	DESIGN SUBMITTAL		

DRAWN: TAG | PROJECT NO: 37478.21
ENGINEER: AA | SCALE: NO SCALE
CHECKED: MAS | APPROVED:
DATE: | DATE:

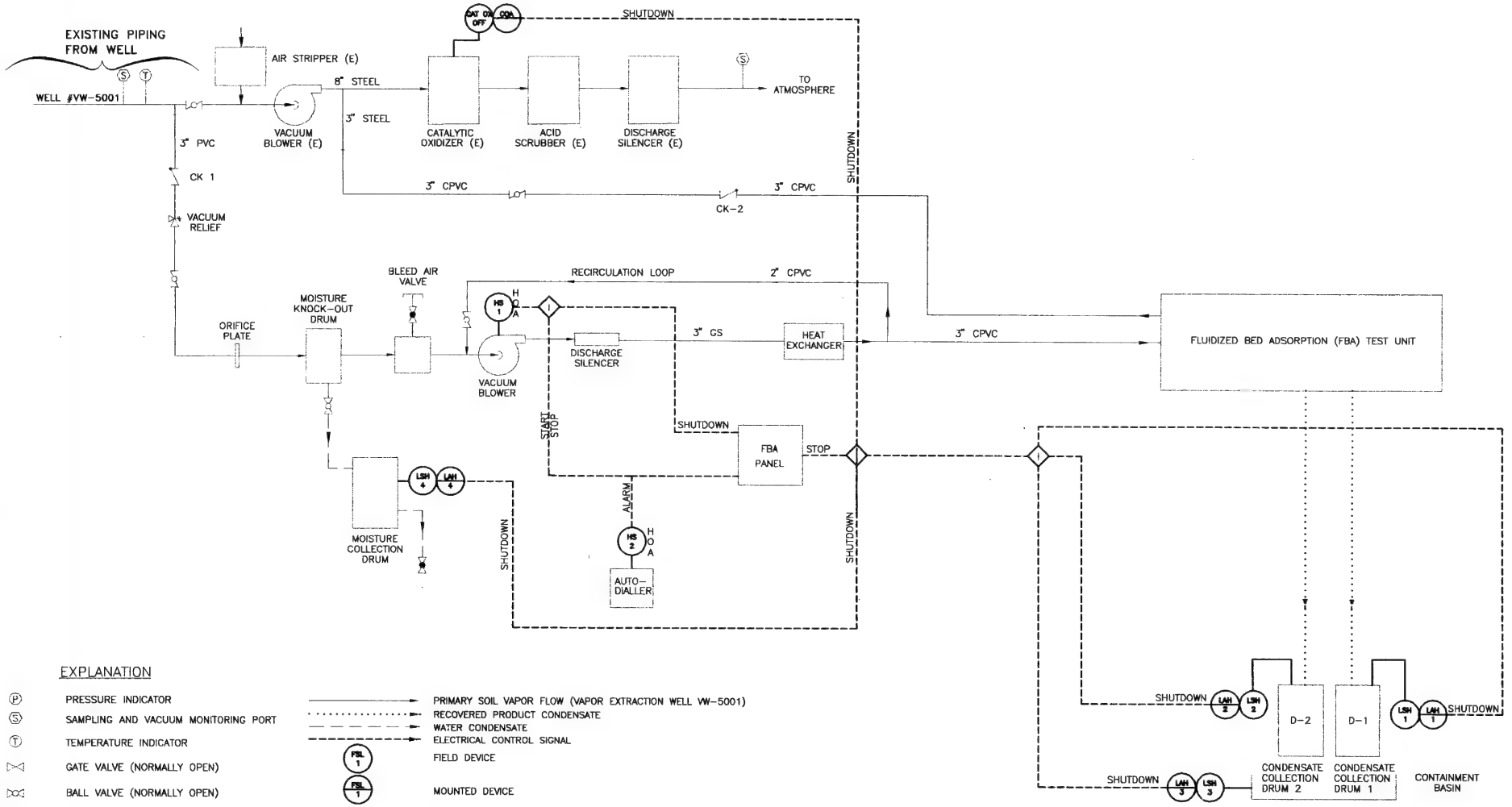
Harding Lawson Associates
Engineering and Environmental Services
90 Digital Drive
Novato, California 94949
Phone (415) 883-0112

FLUIDIZED BED ADSORPTION PRDA TEST
TEST SITE IC-31
McCLELLAN AIR FORCE BASE
SACRAMENTO, CALIFORNIA

PROCESS FLOW DIAGRAM
FBA PRDA TEST

PLATE: P-1
SHEET: 1 OF 4
REVISION NUMBER: 0
DATE: 5/97

37478001.10
19970625.0940



EXPLANATION

- (P) PRESSURE INDICATOR
- (S) SAMPLING AND VACUUM MONITORING PORT
- (T) TEMPERATURE INDICATOR
- GATE VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE (NORMALLY OPEN)
- CHECK VALVE

- PRIMARY SOIL VAPOR FLOW (VAPOR EXTRACTION WELL VW-5001)
- RECOVERED PRODUCT CONDENSATE
- WATER CONDENSATE
- ELECTRICAL CONTROL SIGNAL
- FSL 1 FIELD DEVICE
- FSL 1 MOUNTED DEVICE

LSH	LEVEL SWITCH HIGH
LAH	LEVEL ALARM HIGH
HS	HAND SWITCH
H	HAND
O	OFF
A	AUTOMATIC
I	INTERLOCK
COA	CATALYTIC OXIDIZER OFF ALARM
CAT OX	CATALYTIC OXIDIZER
(E)	EXISTING EQUIPMENT ON SITE

NO.	DATE	REVISIONS	BY	CHK
A	5/97	DESIGN SUBMITTAL		

DRAWN: TAG | PROJECT NO: 37478.21
ENGINEER: AA | SCALE: NO SCALE
CHECKED: MAS | APPROVED:
DATE: | DATE:

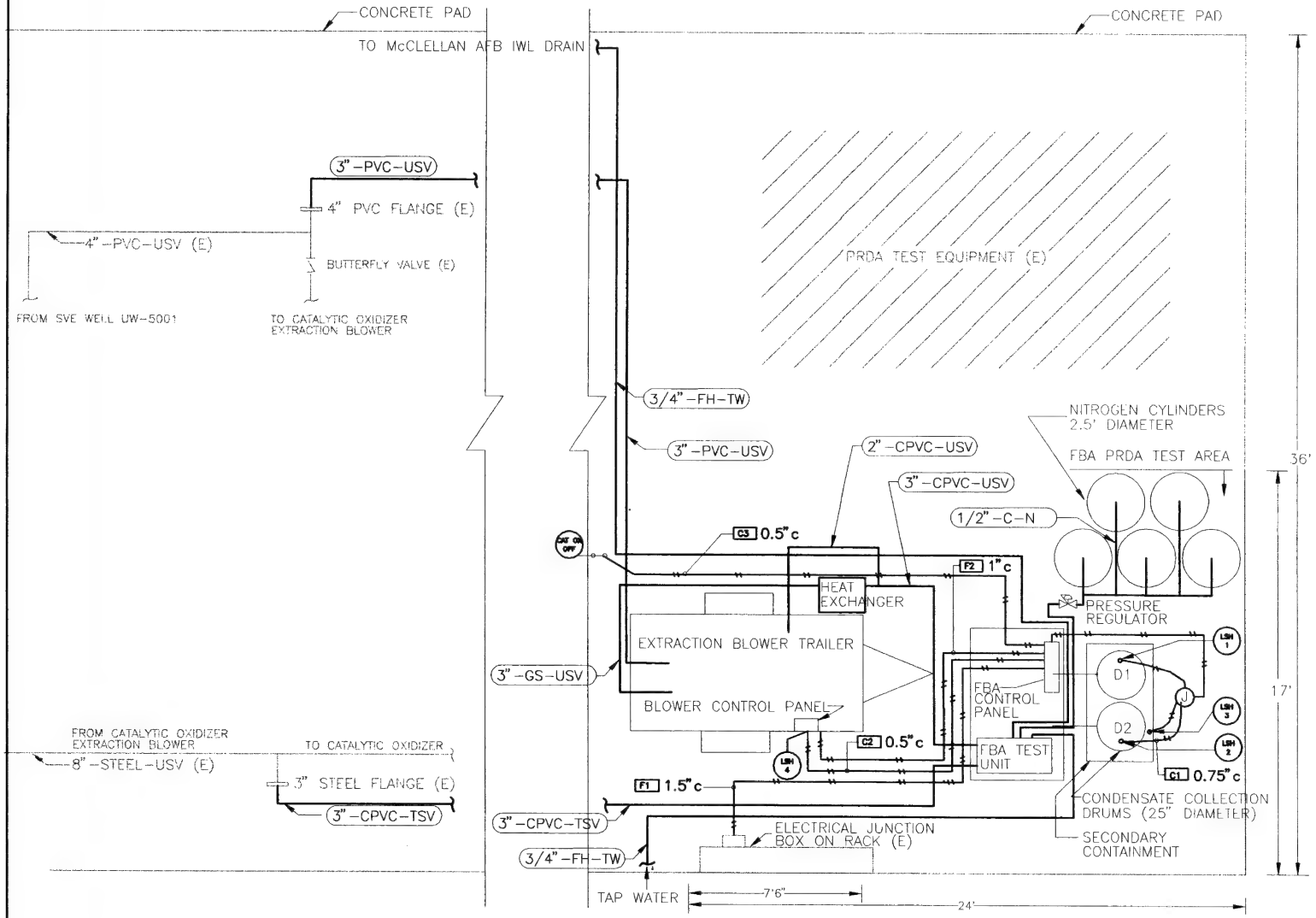
Harding Lawson Associates
Engineering and Environmental Services
90 Digital Drive
Novato, California 94949
Phone (415) 883-0112

FLUIDIZED BED ADSORPTION PRDA TEST
TEST SITE IC-31
McCLELLAN AIR FORCE BASE
SACRAMENTO, CALIFORNIA

INSTRUMENTATION DIAGRAM
FBA PRDA TEST

PLATE: 3
SHEET: 2 OF 4
REVISION NUMBER: 0
DATE: 5/97

37478007.1.0
19970625.0952



ELECTRICAL NOTES

1) ALL CONDUIT TO BE EMT TYPE WITH COMPRESSION FITTINGS. USE LIQUID FLEX TYPE CONDUIT FOR ALL CONNECTIONS TO DEVICES.
2) WIRE SHALL BE TYPE THWN/THHN STRANDED COPPER SIZE AND QUANTITY AS SHOWN ON ONE LINE DIAGRAM.
3) MAINTAIN 3' CLEARANCE BETWEEN ELECTRICAL SUPPLY BOX AND ALL PIPING JOINTS AND EQUIPMENT.

EXPLANATION

USV	UNTREATED SOIL VAPOR
TSV	TREATED SOIL VAPOR
PVC	POLYVINYL CHLORIDE PLASTIC
CPVC	CHLORINATED POLYVINYL CHLORIDE PLASTIC
FBA	FLUIDIZED BED ADSORPTION
FH	FLEXIBLE HOSE
TW	TAP WATER
GS	GALVANIZED STEET
C	COPPER
WC	WATER CONDENSATE
(E)	EXISTING EQUIPMENT ON SITE
N	NITROGEN
McCLELLAN AFB IWL	McCLELLAN AIR FORCE BASE INDUSTRIAL WASTEWATER LINE
	FBA TEST PIPING
	EXISTING PIPING
	ELECTRICAL CONDUIT
J	JUNCTION BOX
3"-PVC-USV	PIPE DIAMETER, PIPE MATERIAL, FLOW STREAM IDENTIFICATION ("BUBBLE" OMITTED FOR EXISTING PIPE)
LSH 4	HIGH LEVEL SWITCH CONTROLLER
C2 0.5"c	ELECTRICAL EQUIPMENT DESIGNATION, CONDUIT DIAMETER — ELECTRICAL EQUIPMENT IDENTIFICATION (SEE ONE-LINE DRAWING FOR DETAILS)

0 3 6
SCALE IN FEET

37478005 .35.0
19970624.1629

A 5/97 DESIGN SUBMITTAL

NO.	DATE	REVISIONS	BY	CHK

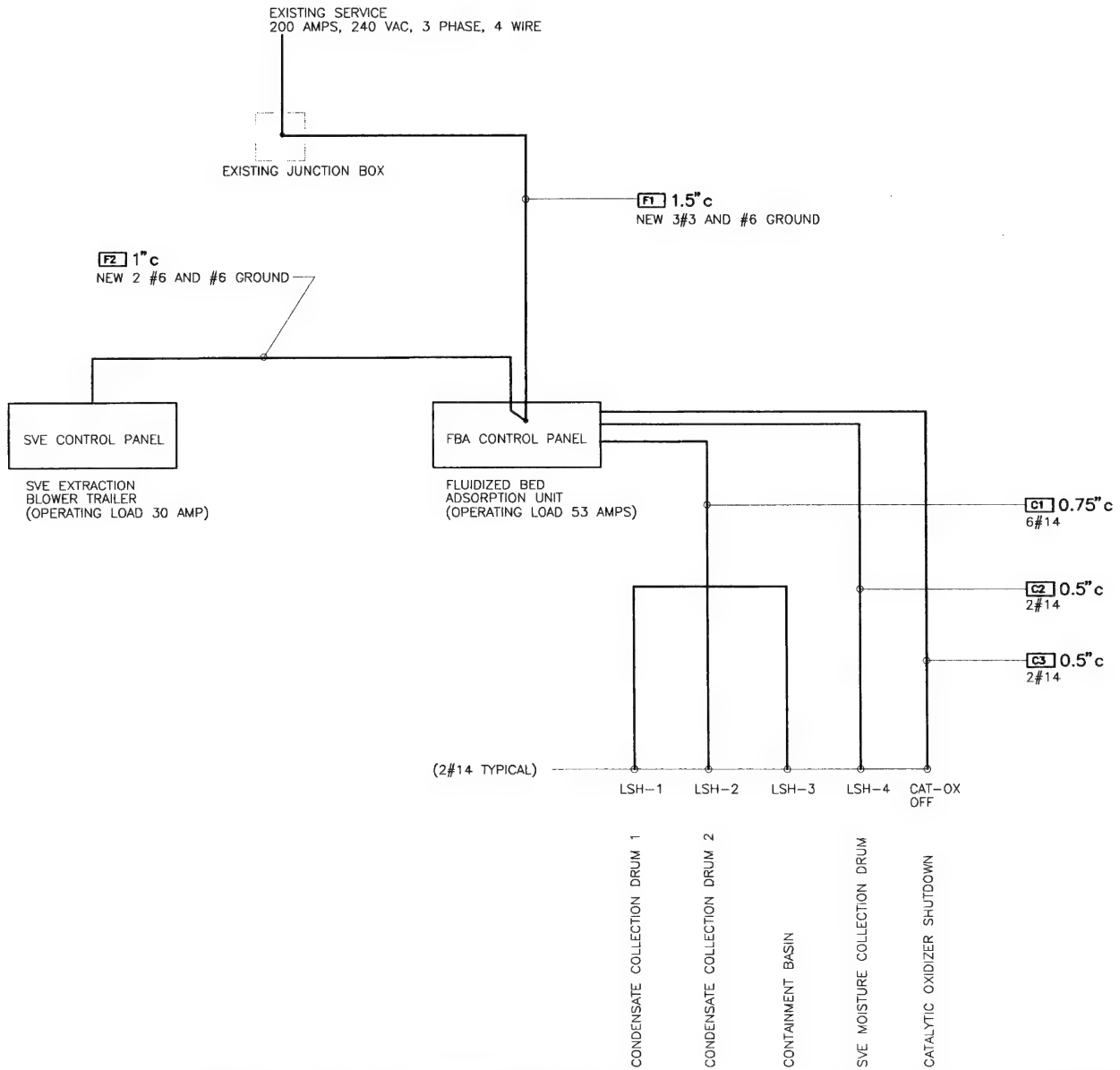
DRAWN: TAG | PROJECT NO: 37478.21
ENGINEER: AA | SCALE: AS SHOWN
CHECKED: MAS | APPROVED:
DATE: | DATE:

Harding Lawson Associates
Engineering and Environmental Services
90 Digital Drive, Novato, California 94948
Phone (415) 883-0112

FLUIDIZED BED ADSORPTION PRDA TEST
TEST SITE IC-31
McCLELLAN AIR FORCE BASE
SACRAMENTO, CALIFORNIA

SITE LAYOUT DIAGRAM
FBA PRDA TEST

PLATE: 4
SHEET: 3 OF 4
REVISION NUMBER: 0
DATE: 5/97



EXPLANATION

SVE	SOIL VAPOR EXTRACTION
FBA	FLUIDIZED BED ADSORPTION
LSH	LEVEL SWITCH HIGH
CAT OX	CATALYTIC OXIDIZER

ELECTRICAL EQUIPMENT DESIGNATION / CONDUIT DIAMETER
C2 0.5"c ELECTRICAL EQUIPMENT IDENTIFICATION
2#14
QUANTITY — WIRE SIZE

37478008.10
19970624.1143

NO.	DATE	REVISIONS	BY	CHK
A	5/97	DESIGN SUBMITTAL		

DRAWN: TAG | PROJECT NO: 37476.21
ENGINEER: AA | SCALE: NO SCALE
CHECKED: MAS | APPROVED:
DATE: | DATE:

Harding Lawson Associates
Engineering and Environmental Services
90 Digital Drive
Novato, California 94949
Phone (415) 883-0112

FLUIDIZED BED ADSORPTION PRDA TEST
TEST SITE IC-31
McCLELLAN AIR FORCE BASE
SACRAMENTO, CALIFORNIA

ONE-LINE DIAGRAM
FBA PRDA

PLATE: 5
SHEET: 4 OF 4
REVISION NUMBER: 0
DATE: 5/97

APPENDIX B

LABORATORY REPORTS - AIR SAMPLES BY EPA TO-14

@AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9708162

Work Order Summary

CLIENT:	Mr. Alfonso Ang Harding Lawson Associates 90 Digital Drive Novato, CA 94949	**BILL TO:** Same	
PHONE:	415-884-3154	**P.O. #**	
FAX:	415-884-3300	**PROJECT #**	37478 35 McClellan FBAS
DATE RECEIVED:	8/12/97		
DATE COMPLETED:	8/19/97		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	FBAE-02	TO-14/TIC's	0 "Hg
02A	FBAI-03	TO-14/TIC's	0.2 psi
03A	FBAB-01	TO-14/TIC's	1.0 "Hg
04A	Lab Blank	TO-14/TIC's	NA

CERTIFIED BY: _____ for
Laboratory Director

DATE: 8/19/97

Certification numbers: CA ELAP - 1149, NY ELAP - 11291, UT ELAP - E-217

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA 95630
(916) 985-1000 • (800) 985-5955 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME : FBAE-02

ID#: 9708162-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1081610**	**Date of Collection:**	**8/ 8/97**
Dil. Factor:	**50.6**	**Date of Analysis:**	**8/16/97**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	40	Not Detected
Freon 114	40	Not Detected
Chloromethane	40	Not Detected
Vinyl Chloride	40	Not Detected
Bromomethane	40	Not Detected
Chloroethane	40	Not Detected
Freon 11	40	Not Detected
1,1-Dichloroethene	40	1300
Freon 113	40	180
Methylene Chloride	40	270
1,1-Dichloroethane	40	2100
cis-1,2-Dichloroethene	40	1200
Chloroform	40	870
1,1,1-Trichloroethane	40	3900
Carbon Tetrachloride	40	150
Benzene	40	Not Detected
1,2-Dichloroethane	40	Not Detected
Trichloroethene	40	7000
1,2-Dichloropropane	40	Not Detected
cis-1,3-Dichloropropene	40	Not Detected
Toluene	40	Not Detected
trans-1,3-Dichloropropene	40	Not Detected
1,1,2-Trichloroethane	40	Not Detected
Tetrachloroethene	40	220
Ethylene Dibromide	40	Not Detected
Chlorobenzene	40	Not Detected
Ethyl Benzene	40	Not Detected
m,p-Xylene	40	Not Detected
o-Xylene	40	Not Detected
Styrene	40	Not Detected
1,1,2,2-Tetrachloroethane	40	Not Detected
1,3,5-Trimethylbenzene	40	Not Detected
1,2,4-Trimethylbenzene	40	Not Detected
1,3-Dichlorobenzene	40	Not Detected
1,4-Dichlorobenzene	40	Not Detected
Chlorotoluene	40	Not Detected
1,2-Dichlorobenzene	40	Not Detected
1,2,4-Trichlorobenzene	40	Not Detected
Hexachlorobutadiene	40	Not Detected
Propylene	160	Not Detected
1,3-Butadiene	160	Not Detected
Acetone	160	Not Detected
Carbon Disulfide	160	Not Detected
2-Propanol	160	Not Detected
trans-1,2-Dichloroethene	160	Not Detected
Vinyl Acetate	160	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : FBAE-02

ID#: 9708162-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1081610**	**Date of Collection: 8/ 8/97**	
Dil. Factor:	**80.8**	**Date of Analysis: 8/16/97**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	160	Not Detected
2-Butanone (Methyl Ethyl Ketone)	160	Not Detected
Hexane	160	Not Detected
Tetrahydrofuran	160	Not Detected
Cyclohexane	160	Not Detected
1,4-Dioxane	160	Not Detected
Bromodichloromethane	160	Not Detected
4-Methyl-2-pentanone	160	Not Detected
2-Hexanone	160	Not Detected
Dibromochloromethane	160	Not Detected
Bromoform	160	Not Detected
4-Ethyltoluene	160	Not Detected
Ethanol	160	Not Detected
Methyl tert-Butyl Ether	160	Not Detected
Heptane	160	Not Detected
TVH*	400	710000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
Pentane, 2,4-dimethyl-	108-08-7	91 %	5200
Hexane, 1-isocyanato-	2525-62-4	Manual ID	22000
1-Hexene, 4-methyl-	3769-23-1	Manual ID	120000
Hexane, 2,4-dimethyl-	589-43-5	Manual ID	36000
Pentane, 3-ethyl-	617-78-7	83 %	84000
Hexane, 2,3,4-trimethyl-	921-47-1	Manual ID	100000
Hexane, 3,4-dimethyl-	583-48-2	Manual ID	5800
Hexane, 2,2,5,5-tetramethyl-	1071-81-4	Manual ID	95000
Pyrrolidine, 3-methyl-	34375-89-8	Manual ID	2300
Decane, 2,2,6-trimethyl-	62237-97-2	72 %	3000
Pentane, 2,2,3,4-tetramethyl-	1186-53-4	Manual ID	4000
Heptane, 3,3,5-trimethyl-	7154-80-5	90 %	2000
Octane, 2,2,6-trimethyl-	62016-28-8	72 %	3200

*Total Volative Hydrocarbons referenced to Propane (MW = 44).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	105	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

AIR TOXICS LTD.

SAMPLE NAME : FBAI-03

ID#: 9708162-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1081609**	**Date of Collection:**	**8/ 8/97**
Dil. Factor:	**265**	**Date of Analysis:**	**8/16/97**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	130	Not Detected
Freon 114	130	Not Detected
Chloromethane	130	Not Detected
Vinyl Chloride	130	Not Detected
Bromomethane	130	Not Detected
Chloroethane	130	Not Detected
Freon 11	130	Not Detected
1,1-Dichloroethene	130	1800
Freon 113	130	180
Methylene Chloride	130	240
1,1-Dichloroethane	130	3100
cis-1,2-Dichloroethene	130	2400
Chloroform	130	1400
1,1,1-Trichloroethane	130	4700
Carbon Tetrachloride	130	160
Benzene	130	Not Detected
1,2-Dichloroethane	130	Not Detected
Trichloroethene	130	22000
1,2-Dichloropropane	130	Not Detected
cis-1,3-Dichloropropene	130	Not Detected
Toluene	130	180
trans-1,3-Dichloropropene	130	Not Detected
1,1,2-Trichloroethane	130	Not Detected
Tetrachloroethene	130	800
Ethylene Dibromide	130	Not Detected
Chlorobenzene	130	Not Detected
Ethyl Benzene	130	Not Detected
m,p-Xylene	130	Not Detected
o-Xylene	130	Not Detected
Styrene	130	Not Detected
1,1,2,2-Tetrachloroethane	130	Not Detected
1,3,5-Trimethylbenzene	130	Not Detected
1,2,4-Trimethylbenzene	130	Not Detected
1,3-Dichlorobenzene	130	Not Detected
1,4-Dichlorobenzene	130	Not Detected
Chlorotoluene	130	Not Detected
1,2-Dichlorobenzene	130	Not Detected
1,2,4-Trichlorobenzene	130	Not Detected
Hexachlorobutadiene	130	Not Detected
Propylene	530	Not Detected
1,3-Butadiene	530	Not Detected
Acetone	530	Not Detected
Carbon Disulfide	530	Not Detected
2-Propanol	530	Not Detected
trans-1,2-Dichloroethene	530	Not Detected
Vinyl Acetate	530	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : FBAI-03

ID#: 9708162-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1081609	**Date of Collection:**	8/ 8/97
Dil. Factor:	265	**Date of Analysis:**	8/16/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	530	Not Detected
2-Butanone (Methyl Ethyl Ketone)	530	Not Detected
Hexane	530	Not Detected
Tetrahydrofuran	530	Not Detected
Cyclohexane	530	Not Detected
1,4-Dioxane	530	Not Detected
Bromodichloromethane	530	Not Detected
4-Methyl-2-pentanone	530	Not Detected
2-Hexanone	530	Not Detected
Dibromochloromethane	530	Not Detected
Bromoform	530	Not Detected
4-Ethyltoluene	530	Not Detected
Ethanol	530	Not Detected
Methyl tert-Butyl Ether	530	Not Detected
Heptane	530	Not Detected
TVH*	1300	1200000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
Pentane, 2,3-dimethyl-	565-59-3	Manual ID	31000
Hexane, 2,2-dimethyl-	590-73-8	Manual ID	190000
Ether, heptyl hexyl	7289-40-9	72 %	64000
Pentane, 2,2,3-trimethyl-	564-02-3	Manual ID	11000
Pentane, 2,3,4-trimethyl-	565-75-3	91 %	120000
Pentane, 2,3,3-trimethyl-	560-21-4	72 %	140000
Hexane, 3,4-dimethyl-	583-48-2	Manual ID	7700
Hexane, 2,2,5,5-tetramethyl-	1071-81-4	72 %	140000
Hexane, 3-ethyl-	619-99-8	72 %	6800
Heptane, 2,2,4-trimethyl-	14720-74-2	72 %	8600
Pentane, 2,2,3,4-tetramethyl-	1186-53-4	Manual ID	13000
Heptane, 3,3,5-trimethyl-	7154-80-5	90 %	5900
Octane, 2,2,6-trimethyl-	62016-28-8	72 %	11000
Hexane, 2,2,3-trimethyl-	16747-25-4	Manual ID	3200

*Total Volative Hydrocarbons referenced to Propane (MW = 44).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	97	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

AIR TOXICS LTD.

SAMPLE NAME : FBAB-01

ID#: 9708162-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1081607**	**Date of Collection: 8/ 8/97**	
Dil. Factor:	**8.35**	**Date of Analysis: 8/16/97**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	4.2	Not Detected
Freon 114	4.2	Not Detected
Chloromethane	4.2	Not Detected
Vinyl Chloride	4.2	Not Detected
Bromomethane	4.2	Not Detected
Chloroethane	4.2	Not Detected
Freon 11	4.2	Not Detected
1,1-Dichloroethene	4.2	Not Detected
Freon 113	4.2	Not Detected
Methylene Chloride	4.2	Not Detected
1,1-Dichloroethane	4.2	Not Detected
cis-1,2-Dichloroethene	4.2	Not Detected
Chloroform	4.2	Not Detected
1,1,1-Trichloroethane	4.2	Not Detected
Carbon Tetrachloride	4.2	Not Detected
Benzene	4.2	Not Detected
1,2-Dichloroethane	4.2	Not Detected
Trichloroethene	4.2	Not Detected
1,2-Dichloropropane	4.2	Not Detected
cis-1,3-Dichloropropene	4.2	Not Detected
Toluene	4.2	Not Detected
trans-1,3-Dichloropropene	4.2	Not Detected
1,1,2-Trichloroethane	4.2	Not Detected
Tetrachloroethene	4.2	Not Detected
Ethylene Dibromide	4.2	Not Detected
Chlorobenzene	4.2	Not Detected
Ethyl Benzene	4.2	Not Detected
m,p-Xylene	4.2	Not Detected
o-Xylene	4.2	Not Detected
Styrene	4.2	Not Detected
1,1,2,2-Tetrachloroethane	4.2	Not Detected
1,3,5-Trimethylbenzene	4.2	Not Detected
1,2,4-Trimethylbenzene	4.2	Not Detected
1,3-Dichlorobenzene	4.2	Not Detected
1,4-Dichlorobenzene	4.2	Not Detected
Chlorotoluene	4.2	Not Detected
1,2-Dichlorobenzene	4.2	Not Detected
1,2,4-Trichlorobenzene	4.2	Not Detected
Hexachlorobutadiene	4.2	Not Detected
Propylene	17	Not Detected
1,3-Butadiene	17	Not Detected
Acetone	17	Not Detected
Carbon Disulfide	17	Not Detected
2-Propanol	17	Not Detected
trans-1,2-Dichloroethene	17	Not Detected
Vinyl Acetate	17	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : FBAB-01

ID#: 9708162-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1081907	**Date of Collection:**	8/ 8/97
Dil. Factor:	8.36	**Date of Analysis:**	8/19/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	17	Not Detected
2-Butanone (Methyl Ethyl Ketone)	17	Not Detected
Hexane	17	Not Detected
Tetrahydrofuran	17	Not Detected
Cyclohexane	17	Not Detected
1,4-Dioxane	17	Not Detected
Bromodichloromethane	17	Not Detected
4-Methyl-2-pentanone	17	Not Detected
2-Hexanone	17	Not Detected
Dibromochloromethane	17	Not Detected
Bromoform	17	Not Detected
4-Ethyltoluene	17	Not Detected
Ethanol	17	Not Detected
Methyl tert-Butyl Ether	17	Not Detected
Heptane	17	Not Detected
TVH*	42	Not Detected

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volative Hydrocarbons referenced to Propane (MW = 44).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	104	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9708162-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1081604**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/16/97**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	0.50	Not Detected
Freon 114	0.50	Not Detected
Chloromethane	0.50	Not Detected
Vinyl Chloride	0.50	Not Detected
Bromomethane	0.50	Not Detected
Chloroethane	0.50	Not Detected
Freon 11	0.50	Not Detected
1,1-Dichloroethene	0.50	Not Detected
Freon 113	0.50	Not Detected
Methylene Chloride	0.50	Not Detected
1,1-Dichloroethane	0.50	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected
Chloroform	0.50	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected
Carbon Tetrachloride	0.50	Not Detected
Benzene	0.50	Not Detected
1,2-Dichloroethane	0.50	Not Detected
Trichloroethene	0.50	Not Detected
1,2-Dichloropropane	0.50	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected
Toluene	0.50	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected
Tetrachloroethene	0.50	Not Detected
Ethylene Dibromide	0.50	Not Detected
Chlorobenzene	0.50	Not Detected
Ethyl Benzene	0.50	Not Detected
m,p-Xylene	0.50	Not Detected
o-Xylene	0.50	Not Detected
Styrene	0.50	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected
Chlorotoluene	0.50	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected
Hexachlorobutadiene	0.50	Not Detected
Propylene	2.0	Not Detected
1,3-Butadiene	2.0	Not Detected
Acetone	2.0	Not Detected
Carbon Disulfide	2.0	Not Detected
2-Propanol	2.0	Not Detected
trans-1,2-Dichloroethene	2.0	Not Detected
Vinyl Acetate	2.0	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9708162-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	1081604	**Date of Collection:**	NA
Dil. Factor:	1.00	**Date of Analysis:**	8/16/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected
Hexane	2.0	Not Detected
Tetrahydrofuran	2.0	Not Detected
Cyclohexane	2.0	Not Detected
1,4-Dioxane	2.0	Not Detected
Bromodichloromethane	2.0	Not Detected
4-Methyl-2-pentanone	2.0	Not Detected
2-Hexanone	2.0	Not Detected
Dibromochloromethane	2.0	Not Detected
Bromoform	2.0	Not Detected
4-Ethyltoluene	2.0	Not Detected
Ethanol	2.0	Not Detected
Methyl tert-Butyl Ether	2.0	Not Detected
Heptane	2.0	Not Detected
TVH*	5.0	Not Detected

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volative Hydrocarbons referenced to Propane (MW = 44).

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	116	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	102	70-130

Harding Lawson Associates
10324 Placer Lane
Sacramento, California 95827
916/364-0793
Telecopy: 916/364-5633

CHAIN OF CUSTODY FORM

9708162

Lab: Air Toxics

Samplers: Dan Gwaltney

Job Number: 37478 35

Name/Location: McClellan FBAS

Project Manager: Mike Sides

Recorder: Dan Gwaltney (Signature Required)

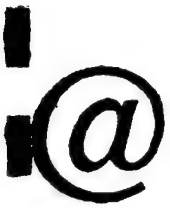
SOURCE CODE	MATRIX: Well (Ag)	Water	Sediment	Soil	Oil	Air	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	TD-14	TICs	TVH	
6 D	X						X			F B	A E	- 0 2	0 8	0 8	9 7	1 1 0 0							X	X	X	0714
↓	X						↓			F B	A I	- 0 3	↓	↓	↓	1 1 0 5							↓	↓	↓	0812 PS
↓						X	↓			F B	A B	- 0 1	↓	↓	↓	1 1 1 0	Field Blank						↓	↓	↓	1014
																										8/13/97

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	OA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Dan Gwaltney	RECEIVED BY: (Signature) Judy Kennedy	DATE/TIME 8/12 1PM
RELINQUISHED BY: (Signature) Judy Kennedy	RECEIVED BY: (Signature)	DATE/TIME 8/12/97 16:14
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
METHOD OF SHIPMENT		

[redacted] Laboratory Copy [redacted] Project Office Copy [redacted] Author's Copy [redacted]



AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 Blue Ravine Road
Suite B
Folsom, CA 95630

Phone (916) 985-1000
FAX (916) 985-1020
Hours 8:00 A.M. to 6:00 P.M. Pacific

COMPANY: Harding Lawson Associates

ATTENTION: Mike Sides

FAX #: (510) 451-3165

FROM: Mike sides

PAGES (Including cover)

COMMENTS:

No kidding Mike, you do have some TIC typing to do. How are your typing skills?

AIR TOXICS LTD.

SAMPLE NAME : FBAI-104

ID#: 9712080-01A

EPA METHOD TO-14 GC/MS Full Scan

File Name: [illegible] Date of Collection: 12/4/97

Dil. Factor: 7.67 Date of Analysis: 12/8/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	77	Not Detected
Freon 114	77	Not Detected
Chloromethane	77	Not Detected
Vinyl Chloride	77	Not Detected
Bromomethane	77	Not Detected
Chloroethane	77	Not Detected
Freon 11	77	960
1,1-Dichloroethene	77	97
Freon 113	77	170
Methylene Chloride	77	2000
1,1-Dichloroethane	77	1400
cis-1,2-Dichloroethene	77	820
Chloroform	77	2600
1,1,1-Trichloroethane	77	Not Detected
Carbon Tetrachloride	77	140
Benzene	77	Not Detected
1,2-Dichloroethane	77	13000
Trichloroethene	77	Not Detected
1,2-Dichloropropane	77	Not Detected
cis-1,3-Dichloropropene	77	330
Toluene	77	Not Detected
trans-1,3-Dichloropropene	77	Not Detected
1,1,2-Trichloroethane	77	370
Tetrachloroethene	77	Not Detected
Ethylene Dibromide	77	Not Detected
Chlorobenzene	77	Not Detected
Ethyl Benzene	77	120
m,p-Xylene	77	Not Detected
o-Xylene	77	Not Detected
Styrene	77	Not Detected
1,1,2,2-Tetrachloroethane	77	Not Detected
1,3,5-Trimethylbenzene	77	Not Detected
1,2,4-Trimethylbenzene	77	Not Detected
1,3-Dichlorobenzene	77	Not Detected
1,4-Dichlorobenzene	77	Not Detected
Chlorotoluene	77	Not Detected
1,2-Dichlorobenzene	77	Not Detected
1,2,4-Trichlorobenzene	77	Not Detected
Hexachlorobutadiene	380	Not Detected
Propylene	380	Not Detected
1,3-Butadiene	380	Not Detected
Acetone	380	Not Detected
Carbon Disulfide	380	Not Detected
2-Propanol	380	Not Detected
trans-1,2-Dichloroethene	380	Not Detected
Vinyl Acetate		

AIR TOXICS LTD.

SAMPLE NAME : FBAI-104

ID#: 9712080-01A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	380	Not Detected
2-Butanone (Methyl Ethyl Ketone)	380	Not Detected
Hexane	380	Not Detected
Tetrahydrofuran	380	Not Detected
Cyclohexane	380	Not Detected
1,4-Dioxane	380	Not Detected
Bromodichloromethane	380	Not Detected
4-Methyl-2-pentanone	380	Not Detected
2-Hexanone	380	Not Detected
Dibromochloromethane	380	Not Detected
Bromoform	380	Not Detected
4-Ethyltoluene	380	Not Detected
Ethanol	380	Not Detected
Methyl tert-Butyl Ether	380	Not Detected
Heptane	380	Not Detected
TVH*	770	380000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
Pentane, 2,4-dimethyl-	108-08-7	72 %	6800
Hexane, 3-methyl-	589-34-4	87 %	6800
Heptane, 2,2,4-trimethyl-	14720-74-2	Manual ID	110000
1-Heptene	592-76-7	90 %	7500
Hexane, 2,5-dimethyl-	592-13-2	70 %	24000
Hexane, 1-(hexyloxy)-2-methyl-	74421-17-3	74 %	25000
Pentane, 2,2,3-trimethyl-	564-02-3	Manual ID	7000
Pentane, 3-ethyl-	617-78-7	86 %	97000
Octane, 4-methyl-	2216-34-4	78 %	120000
Hexane, 2,2,5,5-tetramethyl-	1071-81-4	Manual ID	93000

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	108	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME : FBAI-105

ID#: 9712080-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name: [illegible] Date of Collection: [illegible]
Dil. Factor: [illegible] Date of Analysis: [illegible]

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	95	Not Detected
Freon 114	95	Not Detected
Chloromethane	95	Not Detected
Vinyl Chloride	95	Not Detected
Bromomethane	95	Not Detected
Chloroethane	95	Not Detected
Freon 11	95	Not Detected
1,1-Dichloroethene	95	1100
Freon 113	95	96
Methylene Chloride	95	180
1,1-Dichloroethane	95	2200
cis-1,2-Dichloroethene	95	1500
Chloroform	95	920
1,1,1-Trichloroethane	95	2900
Carbon Tetrachloride	95	Not Detected
Benzene	95	140
1,2-Dichloroethane	95	Not Detected
Trichloroethene	95	16000
1,2-Dichloropropane	95	Not Detected
cis-1,3-Dichloropropene	95	Not Detected
Toluene	95	330
trans-1,3-Dichloropropene	95	Not Detected
1,1,2-Trichloroethane	95	1200
Tetrachloroethene	95	450
Ethylene Dibromide	95	Not Detected
Chlorobenzene	95	Not Detected
Ethyl Benzene	95	Not Detected
m,p-Xylene	95	Not Detected
o-Xylene	95	Not Detected
Styrene	95	Not Detected
1,1,2,2-Tetrachloroethane	95	Not Detected
1,3,5-Trimethylbenzene	95	Not Detected
1,2,4-Trimethylbenzene	95	Not Detected
1,3-Dichlorobenzene	95	Not Detected
1,4-Dichlorobenzene	95	Not Detected
Chlorotoluene	95	Not Detected
1,2-Dichlorobenzene	95	Not Detected
1,2,4-Trichlorobenzene	95	Not Detected
Hexachlorobutadiene	95	Not Detected
Propylene	470	Not Detected
1,3-Butadiene	470	Not Detected
Acetone	470	Not Detected
Carbon Disulfide	470	Not Detected
2-Propanol	470	Not Detected
trans-1,2-Dichloroethene	470	Not Detected
Vinyl Acetate	470	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : FBAI-105

ID#: 9712080-02A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9712013	Date of Collection:	12/2/97
Dil. Factor:	9.42	Date of Analysis:	12/13/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	470	Not Detected
2-Butanone (Methyl Ethyl Ketone)	470	Not Detected
Hexane	470	Not Detected
Tetrahydrofuran	470	Not Detected
Cyclohexane	470	Not Detected
1,4-Dioxane	470	Not Detected
Bromodichloromethane	470	Not Detected
4-Methyl-2-pentanone	470	Not Detected
2-Hexanone	470	Not Detected
Dibromochloromethane	470	Not Detected
Bromoform	470	Not Detected
4-Ethyltoluene	470	Not Detected
Ethanol	470	Not Detected
Methyl tert-Butyl Ether	470	Not Detected
Heptane	470	Not Detected
TVH*	950	390000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
Heptane, 3-methyl-	589-81-1	Manual ID	7200
Pentane, 2,3-dimethyl-	565-59-3	72 %	32000
Heptane, 2,2,4-trimethyl-	14720-74-2	72 %	120000
1-Heptene	592-76-7	Manual ID	8000
Hexane, 2,5-dimethyl-	592-13-2	91 %	23000
Hexane, 1-(hexyloxy0-2-methyl-	74421-17-3	72 %	27000
Pentane, 2,2,3-trimethyl-	564-02-3	74 %	7300
Pentane, 3-ethyl-	617-78-7	86 %	100000
Octane, 4-methyl-	2216-34-4	83 %	120000
Hexane, 2,2,5,5-tetramethyl-	1071-81-4	78 %	94000

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	92	70-130

AIR TOXICS LTD.

SAMPLE NAME : FBAE-104

ID#: 9712080-03A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	18	Not Detected
Freon 114	18	Not Detected
Chloromethane	18	24
Vinyl Chloride	18	Not Detected
Bromomethane	18	Not Detected
Chloroethane	18	Not Detected
Freon 11	18	Not Detected
1,1-Dichloroethene	18	190
Freon 113	18	56
Methylene Chloride	18	40
1,1-Dichloroethane	18	360
cis-1,2-Dichloroethene	18	180
Chloroform	18	130
1,1,1-Trichloroethane	18	870
Carbon Tetrachloride	18	Not Detected
Benzene	18	20
1,2-Dichloroethane	18	Not Detected
Trichloroethene	18	1200
1,2-Dichloropropane	18	Not Detected
cis-1,3-Dichloropropene	18	Not Detected
Toluene	18	22
trans-1,3-Dichloropropene	18	Not Detected
1,1,2-Trichloroethane	18	210
Tetrachloroethene	18	33
Ethylene Dibromide	18	Not Detected
Chlorobenzene	18	Not Detected
Ethyl Benzene	18	Not Detected
m,p-Xylene	18	Not Detected
o-Xylene	18	Not Detected
Styrene	18	Not Detected
1,1,2,2-Tetrachloroethane	18	Not Detected
1,3,5-Trimethylbenzene	18	Not Detected
1,2,4-Trimethylbenzene	18	Not Detected
1,3-Dichlorobenzene	18	Not Detected
1,4-Dichlorobenzene	18	Not Detected
Chlorotoluene	18	Not Detected
1,2-Dichlorobenzene	18	Not Detected
1,2,4-Trichlorobenzene	18	Not Detected
Hexachlorobutadiene	18	Not Detected
Propylene	92	Not Detected
1,3-Butadiene	92	Not Detected
Acetone	92	Not Detected
Carbon Disulfide	92	Not Detected
2-Propanol	92	Not Detected
trans-1,2-Dichloroethene	92	Not Detected
Vinyl Acetate	92	

AIR TOXICS LTD.

SAMPLE NAME : FBAE-104

ID#: 9712080-03A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	A122105	Date of Collection:	12/4/97
Dil. Factor:	1.84	Date of Analysis:	12/22/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	92	Not Detected
2-Butanone (Methyl Ethyl Ketone)	92	Not Detected
Hexane	92	Not Detected
Tetrahydrofuran	92	Not Detected
Cyclohexane	92	Not Detected
1,4-Dioxane	92	Not Detected
Bromodichloromethane	92	Not Detected
4-Methyl-2-pentanone	92	Not Detected
2-Hexanone	92	Not Detected
Dibromochloromethane	92	Not Detected
Bromoform	92	Not Detected
4-Ethyltoluene	92	Not Detected
Ethanol	92	Not Detected
Methyl tert-Butyl Ether	92	Not Detected
Heptane	92	Not Detected
TVH*	180	66000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
1-Pentene, 4-methyl-	691-37-2	Manual ID	1500
Pentane, 2,3-dimethyl-	565-59-3	Manual ID	7200
Pentane, 3-methyl-	96-14-0	72 %	28000
1-Heptene	592-76-7	83 %	1900
Hexane, 2,5-dimethyl-	592-13-2	83 %	2400
Hexane, 2,2,3-trimethyl-	16747-25-4	78 %	1600
Pentane, 3-ethyl-	617-78-7	78 %	18000
Octane, 4-methyl-	2216-34-4	72 %	25000
Hexane, 2,2,5,5-tetramethyl-	1071-81-4	78 %	8700
Hexane, 3-ethyl-	619-99-8	Manual ID	810

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	104	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	86	70-130

AIR TOXICS LTD.

SAMPLE NAME : FBAE-105

ID#: 9712080-04A

EPA METHOD TO-14 GC/MS Full Scan

File Name: [illegible] Date of Collection: 12/3/97

Dil. Factor: 7.6 Date of Analysis: 12/11/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	38	Not Detected
Freon 114	38	Not Detected
Chloromethane	38	Not Detected
Vinyl Chloride	38	Not Detected
Bromomethane	38	Not Detected
Chloroethane	38	Not Detected
Freon 11	38	460
1,1-Dichloroethene	38	93
Freon 113	38	83
Methylene Chloride	38	950
1,1-Dichloroethane	38	540
cis-1,2-Dichloroethene	38	380
Chloroform	38	1900
1,1,1-Trichloroethane	38	61
Carbon Tetrachloride	38	52
Benzene	38	Not Detected
1,2-Dichloroethane	38	4700
Trichloroethene	38	Not Detected
1,2-Dichloropropane	38	Not Detected
cis-1,3-Dichloropropene	38	78
Toluene	38	Not Detected
trans-1,3-Dichloropropene	38	660
1,1,2-Trichloroethane	38	130
Tetrachloroethene	38	Not Detected
Ethylene Dibromide	38	Not Detected
Chlorobenzene	38	Not Detected
Ethyl Benzene	38	Not Detected
m,p-Xylene	38	Not Detected
o-Xylene	38	Not Detected
Styrene	38	Not Detected
1,1,2,2-Tetrachloroethane	38	Not Detected
1,3,5-Trimethylbenzene	38	Not Detected
1,2,4-Trimethylbenzene	38	Not Detected
1,3-Dichlorobenzene	38	Not Detected
1,4-Dichlorobenzene	38	Not Detected
Chlorotoluene	38	Not Detected
1,2-Dichlorobenzene	38	Not Detected
1,2,4-Trichlorobenzene	38	Not Detected
Hexachlorobutadiene	38	Not Detected
Propylene	190	Not Detected
1,3-Butadiene	190	Not Detected
Acetone	190	Not Detected
Carbon Disulfide	190	Not Detected
2-Propanol	190	Not Detected
trans-1,2-Dichloroethene	190	Not Detected
Vinyl Acetate	190	

AIR TOXICS LTD.

SAMPLE NAME : FBAE-105

ID#: 9712080-04A

EPA METHOD TO-14 GC/MS Full Scan

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	190	Not Detected
2-Butanone (Methyl Ethyl Ketone)	190	Not Detected
Hexane	190	Not Detected
Tetrahydrofuran	190	Not Detected
Cyclohexane	190	Not Detected
1,4-Dioxane	190	Not Detected
Bromodichloromethane	190	Not Detected
4-Methyl-2-pentanone	190	Not Detected
2-Hexanone	190	Not Detected
Dibromochloromethane	190	Not Detected
Bromoform	190	Not Detected
4-Ethyltoluene	190	Not Detected
Ethanol	190	Not Detected
Methyl tert-Butyl Ether	190	Not Detected
Heptane	190	Not Detected
TVH*	380	260000

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
Pentane, 2,4-dimethyl-	108-08-7	Manual ID	4000
Pentane, 2,3-dimethyl-	565-59-3	Manual ID	17000
Pentane, 3-methyl-	96-14-0	Manual ID	88000
1-Heptene	592-76-7	Manual ID	4300
Hexane, 2,5-dimethyl-	592-13-2	87 %	9300
Heptane, 4,4-dimethyl-	1068-19-5	Manual ID	12000
Pentane, 2,2,3-trimethyl-	564-02-3	Manual ID	6100
Pentane, 3-ethyl-	617-78-7	90 %	66000
Pentane, 2,3,3-trimethyl-	560-21-4	Manual ID	91000
Hexane, 2,2,3-trimethyl-	16747-25-4	Manual ID	57000

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: 1 Liter Summa Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	104	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	86	70-130

AIR TOXICS LTD.

SAMPLE NAME : Method Spike

ID#: 9712080-05A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9712002	Date of Collection: NR	
Dil. Factor:	1.39	Date of Analysis: 12/10/97	

Compound	Rpt. Limit (ppbv)	% Recovery
Freon 12	0.10	106
Freon 114	0.10	107
Chloromethane	0.10	109
Vinyl Chloride	0.10	107
Bromomethane	0.10	85
Chloroethane	0.10	76
Freon 11	0.10	95
1,1-Dichloroethene	0.10	97
Freon 113	0.10	96
Methylene Chloride	0.10	94
1,1-Dichloroethane	0.10	95
cis-1,2-Dichloroethene	0.10	97
Chloroform	0.10	96
1,1,1-Trichloroethane	0.10	95
Carbon Tetrachloride	0.10	95
Benzene	0.10	96
1,2-Dichloroethane	0.10	98
Trichloroethene	0.10	96
1,2-Dichloropropane	0.10	94
cis-1,3-Dichloropropene	0.10	93
Toluene	0.10	96
trans-1,3-Dichloropropene	0.10	97
1,1,2-Trichloroethane	0.10	102
Tetrachloroethene	0.10	95
Ethylene Dibromide	0.10	101
Chlorobenzene	0.10	100
Ethyl Benzene	0.10	99
m,p-Xylene	0.10	97
o-Xylene	0.10	98
Styrene	0.10	96
1,1,2,2-Tetrachloroethane	0.10	107
1,3,5-Trimethylbenzene	0.10	98
1,2,4-Trimethylbenzene	0.10	101
1,3-Dichlorobenzene	0.10	104
1,4-Dichlorobenzene	0.10	103
Chlorotoluene	0.10	102
1,2-Dichlorobenzene	0.10	107
1,2,4-Trichlorobenzene	0.10	101
Hexachlorobutadiene	0.10	102
Propylene	0.50	108
1,3-Butadiene	0.50	108
Acetone	0.50	98
Carbon Disulfide	0.50	98
2-Propanol	0.50	96
trans-1,2-Dichloroethene	0.50	98
Vinyl Acetate	0.50	92

AIR TOXICS LTD.

SAMPLE NAME : Method Spike

ID#: 9712080-05A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9712047	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/10/97	

Compound	Rpt. Limit (ppbv)	% Recovery
Chloroprene	0.50	92
2-Butanone (Methyl Ethyl Ketone)	0.50	94
Hexane	0.50	93
Tetrahydrofuran	0.50	120
Cyclohexane	0.50	92
1,4-Dioxane	0.50	99
Bromodichloromethane	0.50	96
4-Methyl-2-pentanone	0.50	96
2-Hexanone	0.50	99
Dibromochloromethane	0.50	98
Bromoform	0.50	100
4-Ethyltoluene	0.50	101
Ethanol	0.50	112
Methyl tert-Butyl Ether	0.50	94
Heptane	0.50	93
TVH*	1.0	Not Spiked

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	96	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME : Method Spike

ID#: 9712080-05B

EPA METHOD TO-14 GC/MS Full Scan

File Name:	Date of Collection: NA
Dil. Factor:	Date of Analysis: 12/10/97

Compound	Rpt. Limit (ppbv)	% Recovery
Freon 12	0.10	104
Freon 114	0.10	105
Chloromethane	0.10	108
Vinyl Chloride	0.10	104
Bromomethane	0.10	89
Chloroethane	0.10	92
Freon 11	0.10	93
1,1-Dichloroethene	0.10	96
Freon 113	0.10	93
Methylene Chloride	0.10	93
1,1-Dichloroethane	0.10	94
cis-1,2-Dichloroethene	0.10	96
Chloroform	0.10	94
1,1,1-Trichloroethane	0.10	94
Carbon Tetrachloride	0.10	96
Benzene	0.10	94
1,2-Dichloroethane	0.10	94
Trichloroethene	0.10	93
1,2-Dichloropropane	0.10	92
cis-1,3-Dichloropropene	0.10	94
Toluene	0.10	93
trans-1,3-Dichloropropene	0.10	96
1,1,2-Trichloroethane	0.10	102
Tetrachloroethene	0.10	94
Ethylene Dibromide	0.10	100
Chlorobenzene	0.10	99
Ethyl Benzene	0.10	97
m,p-Xylene	0.10	95
o-Xylene	0.10	96
Styrene	0.10	95
1,1,2,2-Tetrachloroethane	0.10	106
1,3,5-Trimethylbenzene	0.10	97
1,2,4-Trimethylbenzene	0.10	106
1,3-Dichlorobenzene	0.10	108
1,4-Dichlorobenzene	0.10	108
Chlorotoluene	0.10	111
1,2-Dichlorobenzene	0.10	112
1,2,4-Trichlorobenzene	0.10	124
Hexachlorobutadiene	0.10	123
Propylene	0.50	105
1,3-Butadiene	0.50	104
Acetone	0.50	97
Carbon Disulfide	0.50	95
2-Propanol	0.50	99
trans-1,2-Dichloroethene	0.50	95
Vinyl Acetate	0.50	93

AIR TOXICS LTD.

SAMPLE NAME : Method Spike

ID#: 9712080-05B

EPA METHOD TO-14 GC/MS Full Scan

File Name:	9712102	Dilution Factor:	NA
Date of Analysis:	12/19/97	Date of Collection:	NA

Compound	Rpt. Limit (ppbv)	% Recovery
Chloroprene	0.50	96
2-Butanone (Methyl Ethyl Ketone)	0.50	93
Hexane	0.50	93
Tetrahydrofuran	0.50	102
Cyclohexane	0.50	92
1,4-Dioxane	0.50	99
Bromodichloromethane	0.50	94
4-Methyl-2-pentanone	0.50	92
2-Hexanone	0.50	95
Dibromochloromethane	0.50	97
Bromoform	0.50	91
4-Ethyltoluene	0.50	103
Ethanol	0.50	113
Methyl tert-Butyl Ether	0.50	95
Heptane	0.50	91
TVH*	1.0	Not Spiked

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	96	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	110	70-130

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9712080-06A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	8712028	Date of Collection:	N/A
Dil. Factor:	1.00	Date of Analysis:	12/20/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	0.10	Not Detected
Freon 114	0.10	Not Detected
Chloromethane	0.10	Not Detected
Vinyl Chloride	0.10	Not Detected
Bromomethane	0.10	Not Detected
Chloroethane	0.10	Not Detected
Freon 11	0.10	Not Detected
1,1-Dichloroethene	0.10	Not Detected
Freon 113	0.10	Not Detected
Methylene Chloride	0.10	Not Detected
1,1-Dichloroethane	0.10	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected
Chloroform	0.10	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected
Carbon Tetrachloride	0.10	Not Detected
Benzene	0.10	Not Detected
1,2-Dichloroethane	0.10	Not Detected
Trichloroethene	0.10	Not Detected
1,2-Dichloropropane	0.10	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected
Toluene	0.10	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected
Tetrachloroethene	0.10	Not Detected
Ethylene Dibromide	0.10	Not Detected
Chlorobenzene	0.10	Not Detected
Ethyl Benzene	0.10	Not Detected
m,p-Xylene	0.10	Not Detected
o-Xylene	0.10	Not Detected
Styrene	0.10	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected
Chlorotoluene	0.10	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected
1,2,4-Trichlorobenzene	0.10	Not Detected
Hexachlorobutadiene	0.10	Not Detected
Propylene	0.50	Not Detected
1,3-Butadiene	0.50	Not Detected
Acetone	0.50	Not Detected
Carbon Disulfide	0.50	Not Detected
2-Propanol	0.50	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected
Vinyl Acetate	0.50	Not Detected

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9712080-06A

EPA METHOD TO-14 GC/MS Full Scan

File Name:	[illegible]	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	12/10/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	0.50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected
Hexane	0.50	Not Detected
Tetrahydrofuran	0.50	Not Detected
Cyclohexane	0.50	Not Detected
1,4-Dioxane	0.50	Not Detected
Bromodichloromethane	0.50	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected
2-Hexanone	0.50	Not Detected
Dibromochloromethane	0.50	Not Detected
Bromoform	0.50	Not Detected
4-Ethyltoluene	0.50	Not Detected
Ethanol	0.50	Not Detected
Methyl tert-Butyl Ether	0.50	Not Detected
Heptane	0.50	Not Detected
TVH*	1.0	Not Detected

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	104	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9712080-06B

EPA METHOD TO-14 GC/MS Full Scan

File Name: R214n4 Date of Collection: NA

pic Factor: 1.00 Date of Analysis: 12/14/97

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Freon 12	0.10	Not Detected
Freon 114	0.10	Not Detected
Chloromethane	0.10	Not Detected
Vinyl Chloride	0.10	Not Detected
Bromomethane	0.10	Not Detected
Chloroethane	0.10	Not Detected
Freon 11	0.10	Not Detected
1,1-Dichloroethene	0.10	Not Detected
Freon 113	0.10	Not Detected
Methylene Chloride	0.10	Not Detected
1,1-Dichloroethane	0.10	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected
Chloroform	0.10	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected
Carbon Tetrachloride	0.10	Not Detected
Benzene	0.10	Not Detected
1,2-Dichloroethane	0.10	Not Detected
Trichloroethene	0.10	Not Detected
1,2-Dichloropropane	0.10	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected
Toluene	0.10	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected
Tetrachloroethene	0.10	Not Detected
Ethylene Dibromide	0.10	Not Detected
Chlorobenzene	0.10	Not Detected
Ethyl Benzene	0.10	Not Detected
m,p-Xylene	0.10	Not Detected
o-Xylene	0.10	Not Detected
Styrene	0.10	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected
Chlorotoluene	0.10	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected
1,2,4-Trichlorobenzene	0.10	Not Detected
Hexachlorobutadiene	0.10	Not Detected
Propylene	0.50	Not Detected
1,3-Butadiene	0.50	Not Detected
Acetone	0.50	Not Detected
Carbon Disulfide	0.50	Not Detected
2-Propanol	0.50	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected
Vinyl Acetate	0.50	

AIR TOXICS LTD.

SAMPLE NAME : Lab Blank

ID#: 9712080-06B

EPA METHOD TO-14 GC/MS Full Scan

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Chloroprene	0.50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected
Hexane	0.50	Not Detected
Tetrahydrofuran	0.50	Not Detected
Cyclohexane	0.50	Not Detected
1,4-Dioxane	0.50	Not Detected
Bromodichloromethane	0.50	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected
2-Hexanone	0.50	Not Detected
Dibromochloromethane	0.50	Not Detected
Bromoform	0.50	Not Detected
4-Ethyltoluene	0.50	Not Detected
Ethanol	0.50	Not Detected
Methyl tert-Butyl Ether	0.50	Not Detected
Heptane	0.50	Not Detected
TVH*	1.0	Not Detected

TENTATIVELY IDENTIFIED COMPOUNDS - Top 10 Reported

Compound	CAS Number	Match Quality	Amount (ppbv)
None Identified			
None Identified			

*Total Volatile Hydrocarbons referenced to Heptane (MW=100).

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	88	70-130

APPENDIX C

LABORATORY REPORTS - AIR SAMPLES BY EPA 8021 & E18

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report
EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 03-Dec-97
Date Received: N/A
Date Analyzed: 03-Dec-97
Time Analyzed: 2039
Date Reported: 11-Dec-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 011F0101.D
Electronic Filename: 211D1203.QAC
SACODE: RM4
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	190.00	=		5
Chloromethane	CLME	74-87-3	4.00	170.00	=		15
Vinyl chloride	VC	75-01-4	4.00	180.00	=		11
Trichlorofluoromethane	FC11	75-69-4	3.00	170.00	=		17
1,1-Dichloroethene	DCE11	75-35-4	10.00	190.00	=		6
Trichlorotrifluoroethane	FC113	76-13-1	10.00	200.00	=		1
Methylene chloride	MTLNCL	75-09-2	3.00	200.00	=		1
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	200.00	=		1
1,1-Dichloroethane	DCA11	75-34-3	4.00	200.00	=		1
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	210.00	=		3
Chloroform	TCLME	67-66-3	4.00	190.00	=		4
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	190.00	=		7
Carbon tetrachloride	CTCL	56-23-5	3.00	190.00	=		3
1,2-Dichloroethane	DCA12	107-06-2	3.00	200.00	=		1
Benzene	BZ	71-43-2	20.00	1200.00	=		19
Trichloroethene	TCE	79-01-6	3.00	190.00	=		3
Toluene	BZME	108-88-3	20.00	1200.00	=		16
Tetrachloroethene	PCE	127-18-4	3.00	180.00	=		12
Chlorobenzene	CLBZ	108-90-7	4.00	220.00	=		8
Ethylbenzene	EBZ	100-41-4	25.00	1100.00	=		15
m+p-Xylene	XYLMP	1330-20-7	50.00	2400.00	=		18
o-Xylene	XYLO	95-47-6	25.00	1200.00	=		21
Bromochloromethane	BRCLME	74-97-5	0	82.45			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	115.06			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gerald Vogt Date: 12/29/97

Onsite Environmental Laboratories, Inc. 5500 Bolsell Common, Fremont, CA 94538 Tel: (510) 490-8971 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: N/A
Date Analyzed: 03-Dec-97
Time Analyzed: 2114
Date Reported: 11-Dec-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: METHOD BLANK
Sample Volume (ml): 50
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 012F0101.D
Electronic Filename: 212D1203.QAC
SACODE: LB4
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URB URE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	0	U		
Chloromethane	CLME	74-87-3	4.00	0	U		
Vinyl chloride	VC	75-01-4	4.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	3.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	10.00	0	U		
Trichlorotrifluoroethane	FC113	76-13-1	10.00	0	U		
Methylene chloride	MTLNCL	75-09-2	3.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	4.00	0	U		
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	0	U		
Chloroform	TCLME	67-66-3	4.00	0	U		
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	0	U		
Carbon tetrachloride	CTCL	56-23-5	3.00	0	U		
1,2-Dichloroethane	DCA12	107-06-2	3.00	0	U		
Benzene	BZ	71-43-2	20.00	0	U		
Trichloroethene	TCE	79-01-6	3.00	0	U		
Toluene	BZME	108-88-3	20.00	0	U		
Tetrachloroethene	PCE	127-18-4	3.00	0	U		
Chlorobenzene	CLBZ	108-90-7	4.00	0	U		
Ethylbenzene	EBZ	100-41-4	25.00	0	U		
m+p-Xylenes	XYLMP	1330-20-7	50.00	0	U		
o-Xylene	XYLO	95-47-6	25.00	0	U		
Bromochloromethane	BRCLME	74-97-5	0	79.72			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	110.26			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gavin Voigt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocaell Corrance, Fremont, CA 94538 Tel: (510) 490-8571 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report
EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: 03-Dec-97
Date Analyzed: 03-Dec-97
Time Analyzed: 2149
Date Reported: 11-Dec-97
Dilution Factor: 10.00
Concentration Units: PPBV

Field ID #: FBAI101
Site #: N/A
Sample Delivery Group: 8D326
Lab Sample ID: 8D32601
Sample Volume (ml): 5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 013F0101.D
Electronic Filename: 213D1203.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	40.00	0	U		
Chloromethane	CLME	74-87-3	40.00	0	U		
Vinyl chloride	VC	75-01-4	40.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	30.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	100.00	1100.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	100.00	250.00	=		
Methylene chloride	MTLNCL	75-09-2	30.00	130.00	=		
trans-1,2-dichloroethene	DCE12T	156-60-5	40.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	40.00	2200.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	30.00	1700.00	=		
Chloroform	TCLME	67-66-3	40.00	1000.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	40.00	2600.00	=		
Carbon tetrachloride	CTCL	56-23-5	30.00	170.00	=		
1,2-Dichloroethane	DCA12	107-06-2	30.00	80.00	=		
Benzene	BZ	71-43-2	200.00	15000.00	=		
Trichloroethene	TCE	79-01-6	30.00	11000.00	=		
Toluene	BZME	108-88-3	200.00	17000.00	=		
Tetrachloroethene	PCE	127-18-4	30.00	470.00	=		
Chlorobenzene	CLBZ	108-90-7	40.00	0	U		
Ethylbenzene	EBZ	100-41-4	250.00	7500.00	=		
m+p-Xylenes	XYLMP	1330-20-7	500.00	4200.00	=		
o-Xylene	XYLO	95-47-6	250.00	3500.00	=		
Bromochloromethane	BRCLME	74-97-5	0	82.52			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	112.37			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gavin Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bolsall Common, Fremont, CA 94538 Tel: (510) 490-8571 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: 03-Dec-97
Date Analyzed: 03-Dec-97
Time Analyzed: 2223
Date Reported: 11-Dec-97
Dilution Factor: 10.00
Concentration Units: PPBV

Field ID #: FBAE101
Site #: N/A
Sample Delivery Group: 8D326
Lab Sample ID: 8D32602
Sample Volume (ml): 5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 014F0101.D
Electronic Filename: 214D1203.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	40.00	0	U		
Chloromethane	CLME	74-87-3	40.00	0	U		
Vinyl chloride	VC	75-01-4	40.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	30.00	0	U		
1,1-Dichloroethane	DCE11	75-35-4	100.00	250.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	100.00	0	U		
Methylene chloride	MTLNCL	75-09-2	30.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	40.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	40.00	320.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	30.00	160.00	=		
Chloroform	TCLME	67-66-3	40.00	190.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	40.00	840.00	=		
Carbon tetrachloride	CTCL	56-23-5	30.00	44.00	=		
1,2-Dichloroethane	DCA12	107-06-2	30.00	0	U		
Benzene	BZ	71-43-2	200.00	3600.00	=		
Trichloroethene	TCE	79-01-6	30.00	1200.00	=		
Toluene	BZME	108-88-3	200.00	2800.00	=		
Tetrachloroethene	PCE	127-18-4	30.00	54.00	=		
Chlorobenzene	CLBZ	108-90-7	40.00	0	U		
Ethylbenzene	EBZ	100-41-4	250.00	350.00	=		
m+p-Xylenes	XYLMP	1330-20-7	500.00	0	U		
o-Xylene	XYLO	95-47-6	250.00	0	U		
Bromochloromethane	BRCLME	74-97-5	0	80.06			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	110.26			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gerald Voyt Date: 12/30/97

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report
EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: 03-Dec-97
Date Analyzed: 03-Dec-97
Time Analyzed: 2258
Date Reported: 11-Dec-97
Dilution Factor: 10.00
Concentration Units: PPBV

Field ID #: FBAI103
Site #: N/A
Sample Delivery Group: 8D326
Lab Sample ID: 8D32603
Sample Volume (ml): 5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 015F0101.D
Electronic Filename: 215D1203.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	40.00	0	U		
Chloromethane	CLME	74-87-3	40.00	0	U		
Vinyl chloride	VC	75-01-4	40.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	30.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	100.00	1200.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	100.00	0	U		
Methylene chloride	MTLNCL	75-09-2	30.00	120.00	=		
trans-1,2-dichloroethene	DCE12T	156-60-5	40.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	40.00	2000.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	30.00	1600.00	=		
Chloroform	TCLME	67-66-3	40.00	940.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	40.00	2400.00	=		
Carbon tetrachloride	CTCL	56-23-5	30.00	150.00	=		
1,2-Dichloroethane	DCA12	107-06-2	30.00	75.00	=		
Benzene	BZ	71-43-2	200.00	13000.00	=		
Trichloroethene	TCE	79-01-6	30.00	11000.00	=		
Toluene	BZME	108-88-3	200.00	15000.00	=		
Tetrachloroethene	PCE	127-18-4	30.00	430.00	=		
Chlorobenzene	CLBZ	108-90-7	40.00	0	U		
Ethylbenzene	EBZ	100-41-4	250.00	6500.00	=		
m+p-Xylene	XYLMP	1330-20-7	500.00	3600.00	=		
o-Xylene	XYLO	95-47-6	250.00	3000.00	=		
Bromochloromethane	BRCLME	74-97-5	0	80.84			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	108.12			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURE:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gavin Yuyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocoll Common, Fremont, CA 94538 Tel: (510) 490-8571 Fax: (510) 490-8572

ONSITE
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Analytical Laboratory Report

EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: 03-Dec-97
Date Analyzed: 03-Dec-97
Time Analyzed: 2332
Date Reported: 11-Dec-97
Dilution Factor: 10.00
Concentration Units: PPBV

Field ID #: FBAE103
Site #: N/A
Sample Delivery Group: 8D326
Lab Sample ID: 8D32604
Sample Volume (ml): 5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 016F0101.D
Electronic Filename: 216D1203.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	40.00	0	U		
Chloromethane	CLME	74-87-3	40.00	0	U		
Vinyl chloride	VC	75-01-4	40.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	30.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	100.00	580.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	100.00	0	U		
Methylene chloride	MTLNCL	75-09-2	30.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	40.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	40.00	790.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	30.00	480.00	=		
Chloroform	TCLME	67-66-3	40.00	390.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	40.00	1500.00	=		
Carbon tetrachloride	CTCL	56-23-5	30.00	83.00	=		
1,2-Dichloroethane	DCA12	107-06-2	30.00	0	U		
Benzene	BZ	71-43-2	200.00	9800.00	=		
Trichloroethene	TCE	79-01-6	30.00	3600.00	=		
Toluene	BZME	108-88-3	200.00	7800.00	=		
Tetrachloroethene	PCE	127-18-4	30.00	130.00	=		
Chlorobenzene	CLBZ	108-90-7	40.00	0	U		
Ethylbenzene	EBZ	100-41-4	250.00	2000.00	=		
m+p-Xylenes	XYLMP	1330-20-7	500.00	1100.00	=		
o-Xylene	XYLO	95-47-6	250.00	760.00	=		
Bromochloromethane	BRCLME	74-97-5	0	80.41			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	110.69			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gerald Vogt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8571 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
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Analytical Laboratory Report
EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 03-Dec-97
Date Received: 03-Dec-97
Date Analyzed: 04-Dec-97
Time Analyzed: 0006
Date Reported: 11-Dec-97
Dilution Factor: 10.00
Concentration Units: PPBV

Field ID #: FBAD101
Site #: N/A
Sample Delivery Group: 8D326
Lab Sample ID: 8D32605
Sample Volume (ml): 5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 017F0101.D
Electronic Filename: 217D1203.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	40.00	0	U		
Chloromethane	CLME	74-87-3	40.00	0	U		
Vinyl chloride	VC	75-01-4	40.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	30.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	100.00	240.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	100.00	0	U		
Methylene chloride	MTLNCL	75-09-2	30.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	40.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	40.00	310.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	30.00	150.00	=		
Chloroform	TCLME	67-66-3	40.00	180.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	40.00	820.00	=		
Carbon tetrachloride	CTCL	56-23-5	30.00	43.00	=		
1,2-Dichloroethane	DCA12	107-06-2	30.00	0	U		
Benzene	BZ	71-43-2	200.00	3500.00	=		
Trichloroethene	TCE	79-01-6	30.00	1200.00	=		
Toluene	BZME	108-88-3	200.00	1600.00	=		
Tetrachloroethene	PCE	127-18-4	30.00	52.00	=		
Chlorobenzene	CLBZ	108-90-7	40.00	0	U		
Ethylbenzene	EBZ	100-41-4	250.00	270.00	=		
m+p-Xylene	XYLMP	1330-20-7	500.00	0	U		
o-Xylene	XYLO	95-47-6	250.00	0	U		
Bromochloromethane	BRCLME	74-97-5	0	78.67			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	108.70			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gavin Vogt Date: 12/30/97

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ONSITE
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Analytical Laboratory Report

EPA Methods 8021

Project #: 37478 35
Client: Harding Lawson Associates
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 03-Dec-97
Date Received: N/A
Date Analyzed: 04-Dec-97
Time Analyzed: 0041
Date Reported: 11-Dec-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D1203A2
Data Filename: 018F0101.D
Electronic Filename: 218D1203.QAC
SACODE: RM6
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	UR5 USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	190.00	=		4
Chloromethane	CLME	74-87-3	4.00	170.00	=		13
Vinyl chloride	VC	75-01-4	4.00	180.00	=		10
Trichlorofluoromethane	FC11	75-69-4	3.00	150.00	=		24
1,1-Dichloroethene	DCE11	75-35-4	10.00	170.00	=		15
Trichlorotrifluoroethane	FC113	76-13-1	10.00	230.00	=		13
Methylene chloride	MTLNCL	75-09-2	3.00	200.00	=		0
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	200.00	=		1
1,1-Dichloroethane	DCA11	75-34-3	4.00	200.00	=		1
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	210.00	=		3
Chloroform	TCLME	67-66-3	4.00	190.00	=		5
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	180.00	=		8
Carbon tetrachloride	CTCL	56-23-5	3.00	190.00	=		4
1,2-Dichloroethane	DCA12	107-06-2	3.00	190.00	=		3
Benzene	BZ	71-43-2	20.00	1200.00	=		19
Trichloroethene	TCE	79-01-6	3.00	190.00	=		4
Toluene	BZME	108-88-3	20.00	1200.00	=		15
Tetrachloroethene	PCE	127-18-4	3.00	180.00	=		12
Chlorobenzene	CLBZ	108-90-7	4.00	210.00	=		4
Ethylbenzene	EBZ	100-41-4	25.00	1100.00	=		9
m+p-Xylene	XYLMP	1330-20-7	50.00	2200.00	=		12
o-Xylene	XYLO	95-47-6	25.00	1100.00	=		13
Bromochloromethane	BRCLME	74-97-5	0	82.79			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	113.97			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030 .

Approved By: Gerald Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8571 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	N/A
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	N/A
Sample Type:	AIR / STANDARD	**Lab Sample ID:**	2.0ML S8090
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	2.0
Date Received:	N/A	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2043	**Data Filename:**	018F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	118D1203.QAC
Dilution Factor:	1.00	**SACODE:**	RMQ
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Methane	CH4	74-82-8	200.00	1100.00	-		6

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gavin Vogt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Boscell Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	N/A
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	N/A
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	METHOD BLANK
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	2
Date Received:	N/A	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2102	**Data Filename:**	019F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	119D1203.QAC
Dilution Factor:	1.00	**SACODE:**	LBO
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-2	200.00	0	U		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gareth Voight Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
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LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAI101
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32601
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2122	**Data Filename:**	020F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	120D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-80-2	80.00	2700.00	-		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gareth Unit Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAI101
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32601
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2327	**Data Filename:**	025F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	125D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-2	80.00	2700.00	=		0

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gordon Voigt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bolsell Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAE101
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32602
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2143	**Data Filename:**	021F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	121D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-3	80.00	480.00	=		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gerald Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocell Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
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Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAI103
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32603
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2203	**Data Filename:**	022F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	122D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-2	80.00	2300.00	-		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gerald Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5509 Bonsall Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAE103
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32604
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2223	**Data Filename:**	023F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	123D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-2	80.00	1400.00	=		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Garth Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
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LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	FBAD101
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D326
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D32605
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	5
Date Received:	03-Dec-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2244	**Data Filename:**	024F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	124D1203.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-00-0	80.00	440.00	=		

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gerald Voigt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocelli Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

ONSITE
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LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	37478 35	**Field ID #:**	N/A
Client:	Harding Lawson Associates	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	N/A
Sample Type:	AIR / STANDARD	**Lab Sample ID:**	2.0ML S8090
Date Sampled:	03-Dec-97	**Sample Volume (ml):**	2.0
Date Received:	N/A	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	03-Dec-97	**QC Batch Code:**	8D1203A3
Time Analyzed:	2350	**Data Filename:**	026F0101.D
Date Reported:	11-Dec-97	**Electronic Filename:**	126D1203.QAC
Dilution Factor:	1.00	**SACODE:**	RMR
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Methane	CH4	74-82-8	200.00	1100.00	=		3

NOTES:

R - Data rejected.

E - Data estimated due to exceedance of calibration range.

D - Dilution.

B - Blank contamination.

U - Analytes not detected at, or above the stated detection limit.

Q - parameter is out of control limits.

0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.

PPMV - Parts per million volume.

MQL - Method quantitation limit.

PD - Percent difference.

RPD - Relative percent difference.

PROCEDURES:

This analysis was performed using EPA Method 18 modified.

Approved By: Gavin Voyt Date: 12/30/97

Onsite Environmental Laboratories, Inc. 5500 Bocell Common, Fremont, CA 94538 Tel: (510) 490-8572 Fax: (510) 490-8572

Harding Lawson Associates
10324 Placer Lane
Sacramento, California 95827
916/364-0793
Telecopy 916/364-5633

CHAIN OF CUSTODY FORM

Lab: Onsite Labs

Job Number: 37479 35

Name/Location: McClellan FBAS

Project Manager: Mike Sides

Samplers: Dan Gourlley

Recorder: (Signature Required)

FEB 23 '98 08:41PM HLA * OAKLAND

ISOURCE CODE	MATRIX: Air	Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
2	X					X			F	B	A	I	1	0	1	9 7 1 2 0 3 0 9 0 0
									F	B	A	E	1	0	1	0 9 1 0
									F	B	A	I	1	0	3	1 3 4 3
									F	B	A	E	1	0	3	1 3 4 7
									F	B	A	D	1	0	1	0 9 1 0

ANALYSIS REQUESTED	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	EPA 8021 VOC's	E18 modified NMHC	8D326
1							X	X	/ /
2									/ /
3									/ /
4									/ /
5									/ /

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Dan Gourley	RECEIVED BY: (Signature) Peggy Kinney	DATE/TIME Dec 3 1997 1540
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
METHOD OF SHIPMENT		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

P.19

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1511
Date Reported: 05-Sep-97
Dilution Factor: 50.00
Concentration Units: PPBV

Field ID #: FBAI02
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27719
Sample Volume (ml): 1
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 003F0101.D
Electronic Filename: 203D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	200.00	0	U		
Chloromethane	CLME	74-87-3	200.00	0	U		
Vinyl chloride	VC	75-01-4	200.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	150.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	500.00	1800.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	500.00	0	U		
Methylene chloride	MTLNCL	75-09-2	150.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	200.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	200.00	3100.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	150.00	2700.00	=		
Chloroform	TCLME	67-66-3	200.00	2100.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	200.00	5200.00	=		
Carbon tetrachloride	CTCL	56-23-5	150.00	310.00	=		
1,2-Dichloroethane	DCA12	107-06-2	150.00	0	U		
Benzene	BZ	71-43-2	1000.00	24000.00	=		
Trichloroethene	TCE	79-01-6	150.00	24000.00	=		
Toluene	BZME	108-88-3	1000.00	21000.00	=		
Tetrachloroethene	PCE	127-18-4	150.00	1000.00	=		
Chlorobenzene	CLBZ	108-90-7	200.00	0	U		
Ethylbenzene	EBZ	100-41-4	1300.00	8700.00	=		
m+p-Xylenes	XYLMP	1330-20-7	2500.00	4200.00	=		
o-Xylene	XYLO	95-47-6	1300.00	9100.00	=		
Bromochloromethane	BRCLME	74-97-5	0	90.69			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	98.01			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1550
Date Reported: 05-Sep-97
Dilution Factor: 50.00
Concentration Units: PPBV

Field ID #: FBAE01
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27720
Sample Volume (ml): 1
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 004F0101.D
Electronic Filename: 204D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	200 00	0	U		
Chloromethane	CLME	74-87-3	200 00	0	U		
Vinyl chloride	VC	75-01-4	200 00	0	U		
Trichlorofluoromethane	FC11	75-69-4	150 00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	500 00	1000 00	=		
Trichlorotrifluoroethane	FC113	76-13-1	500 00	0	U		
Methylene chloride	MTLNCL	75-09-2	150 00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	200 00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	200 00	1600 00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	150 00	1000 00	=		
Chloroform	TCLME	67-66-3	200 00	1300 00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	200 00	4000 00	=		
Carbon tetrachloride	CTCL	56-23-5	150 00	220 00	=		
1,2-Dichloroethane	DCA12	107-06-2	150 00	0	U		
Benzene	BZ	71-43-2	1000 00	21000 00	=		
Trichloroethene	TCE	79-01-6	150 00	7600 00	=		
Toluene	BZME	108-88-3	1000 00	17000 00	=		
Tetrachloroethene	PCE	127-18-4	150 00	330 00	=		
Chlorobenzene	CLBZ	108-90-7	200 00	0	U		
Ethylbenzene	EBZ	100-41-4	1300 00	6500 00	=		
m+p-Xylenes	XYLMP	1330-20-7	2500 00	3000 00	=		
o-Xylene	XYLO	95-47-6	1300 00	6000 00	=		
Bromochloromethane	BRCLME	74-97-5	0	89 70			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	101 04			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1628
Date Reported: 05-Sep-97
Dilution Factor: 50.00
Concentration Units: PPBV

Field ID #: FBAD01
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27721
Sample Volume (ml): 1
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 005F0101.D
Electronic Filename: 205D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	200.00	0	U		
Chloromethane	CLME	74-87-3	200.00	0	U		
Vinyl chloride	VC	75-01-4	200.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	150.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	500.00	1700.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	500.00	0	U		
Methylene chloride	MTLNCL	75-09-2	150.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	200.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	200.00	3100.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	150.00	2600.00	=		
Chloroform	TCLME	67-66-3	200.00	2000.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	200.00	5200.00	=		
Carbon tetrachloride	CTCL	56-23-5	150.00	330.00	=		
1,2-Dichloroethane	DCA12	107-06-2	150.00	0	U		
Benzene	BZ	71-43-2	1000.00	23000.00	=		
Trichloroethene	TCE	79-01-6	150.00	24000.00	=		
Toluene	BZME	108-88-3	1000.00	20000.00	=		
Tetrachloroethene	PCE	127-18-4	150.00	1000.00	=		
Chlorobenzene	CLBZ	108-90-7	200.00	0	U		
Ethylbenzene	EBZ	100-41-4	1300.00	8900.00	=		
m+p-Xylenes	XYLMP	1330-20-7	2500.00	4300.00	=		
o-Xylene	XYLO	95-47-6	1300.00	9700.00	=		
Bromochloromethane	BRCLME	74-97-5	0	91.24			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	103.19			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1706
Date Reported: 05-Sep-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBAI02
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27719
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 006F0101.D
Electronic Filename: 206D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	80 00	0	U		
Chloromethane	CLME	74-87-3	80 00	0	U		
Vinyl chloride	VC	75-01-4	80 00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60 00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200 00	2000 00	=		
Trichlorotrifluoroethane	FC113	76-13-1	200 00	0	U		
Methylene chloride	MTLNCL	75-09-2	60 00	160 00	=		
trans-1,2-dichloroethene	DCE12T	156-60-5	80 00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80 00	3200 00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	60 00	2900 00	=		
Chloroform	TCLME	67-66-3	80 00	1800 00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	80 00	4800 00	=		
Carbon tetrachloride	CTCL	56-23-5	60 00	340 00	=		
1,2-Dichloroethane	DCA12	107-06-2	60 00	85 00	=		
Benzene	BZ	71-43-2	400 00	24000 00	=		
Trichloroethene	TCE	79-01-6	60 00	21000 00	=		
Toluene	BZME	108-88-3	400 00	1000 00	=		
Tetrachloroethene	PCE	127-18-4	60 00	940 00	=		
Chlorobenzene	CLBZ	108-90-7	80 00	0	U		
Ethylbenzene	EBZ	100-41-4	500 00	9600 00	=		
m+p-Xylenes	XYLMP	1330-20-7	1000 00	4900 00	=		
o-Xylene	XYLO	95-47-6	500 00	860 00	=		
Bromochloromethane	BRCLME	74-97-5	0	93 63			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	105.26			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1744
Date Reported: 05-Sep-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBAE01
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27720
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 007F0101.D
Electronic Filename: 207D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	80.00	0	U		
Chloromethane	CLME	74-87-3	80.00	0	U		
Vinyl chloride	VC	75-01-4	80.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200.00	1400.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	200.00	0	U		
Methylene chloride	MTLNCL	75-09-2	60.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	80.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80.00	1900.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	60.00	1300.00	=		
Chloroform	TCLME	67-66-3	80.00	1100.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	80.00	3800.00	=		
Carbon tetrachloride	CTCL	56-23-5	60.00	230.00	=		
1,2-Dichloroethane	DCA12	107-06-2	60.00	0	U		
Benzene	BZ	71-43-2	400.00	20000.00	=		
Trichloroethene	TCE	79-01-6	60.00	7600.00	=		
Toluene	BZME	108-88-3	400.00	580.00	=		
Tetrachloroethene	PCE	127-18-4	60.00	270.00	=		
Chlorobenzene	CLBZ	108-90-7	80.00	0	U		
Ethylbenzene	EBZ	100-41-4	500.00	6600.00	=		
m+p-Xylenes	XYLMP	1330-20-7	1000.00	3000.00	=		
o-Xylene	XYLO	95-47-6	500.00	1800.00	=		
Bromochloromethane	BRCLME	74-97-5	0	93.48			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	105.68			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1822
Date Reported: 05-Sep-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBAD01
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27721
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 008F0101.D
Electronic Filename: 208D0808.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	80 00	0	U		
Chloromethane	CLME	74-87-3	80 00	0	U		
Vinyl chloride	VC	75-01-4	80 00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60 00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200 00	2000 00	=		
Trichlorotrifluoroethane	FC113	76-13-1	200 00	0	U		
Methylene chloride	MTLNCL	75-09-2	60 00	150 00	=		
trans-1,2-dichloroethene	DCE12T	156-60-5	80 00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80 00	3300 00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	60 00	2800 00	=		
Chloroform	TCLME	67-66-3	80 00	1800 00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	80 00	4700 00	=		
Carbon tetrachloride	CTCL	56-23-5	60 00	340 00	=		
1,2-Dichloroethane	DCA12	107-06-2	60 00	82 00	=		
Benzene	BZ	71-43-2	400 00	22000 00	=		
Trichloroethene	TCE	79-01-6	60 00	20000 00	=		
Toluene	BZME	108-88-3	400 00	970 00	=		
Tetrachloroethene	PCE	127-18-4	60 00	920 00	=		
Chlorobenzene	CLBZ	108-90-7	80 00	0	U		
Ethylbenzene	EBZ	100-41-4	500 00	9100 00	=		
m+p-Xylenes	XYLMP	1330-20-7	1000 00	4700 00	=		
o-Xylene	XYLO	95-47-6	500 00	800 00	=		
Bromochloromethane	BRCLME	74-97-5	0	92 52			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	103 15			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: 08-Aug-97
Date Analyzed: 08-Aug-97
Time Analyzed: 1901
Date Reported: 05-Sep-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBAI02
Site #: N/A
Sample Delivery Group: 8D277
Lab Sample ID: 8D27719
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 009F0101.D
Electronic Filename: 209D0808.QAC
SACODE: LR2
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	80.00	0	U		
Chloromethane	CLME	74-87-3	80.00	0	U		
Vinyl chloride	VC	75-01-4	80.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200.00	2100.00	=		5
Trichlorotrifluoroethane	FC113	76-13-1	200.00	0	U		
Methylene chloride	MTLNCL	75-09-2	60.00	160.00	=		0
trans-1,2-dichloroethene	DCE12T	156-60-5	80.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80.00	3500.00	=		9
cis-1,2-dichloroethene	DCE12C	156-59-2	60.00	2900.00	=		0
Chloroform	TCLME	67-66-3	80.00	1800.00	=		0
1,1,1-Trichloroethane	TCA111	71-55-6	80.00	4800.00	=		0
Carbon tetrachloride	CTCL	56-23-5	60.00	350.00	=		3
1,2-Dichloroethane	DCA12	107-06-2	60.00	88.00	=		4
Benzene	BZ	71-43-2	400.00	22000.00	=		9
Trichloroethene	TCE	79-01-6	60.00	21000.00	=		0
Toluene	BZME	108-88-3	400.00	980.00	=		2
Tetrachloroethene	PCE	127-18-4	60.00	930.00	=		1
Chlorobenzene	CLBZ	108-90-7	80.00	0	U		
Ethylbenzene	EBZ	100-41-4	500.00	9100.00	=		5
m+p-Xylenes	XYLMP	1330-20-7	1000.00	4600.00	=		6
o-Xylene	XYLO	95-47-6	500.00	790.00	=		8
Bromochloromethane	BRCLME	74-97-5	0	93.20			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	103.47			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gareth Voigt Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 08-Aug-97
Date Received: N/A
Date Analyzed: 08-Aug-97
Time Analyzed: 2039
Date Reported: 05-Sep-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 010F0101.D
Electronic Filename: 210D0808.QAC
SACODE: RM4
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4 00	210 00	=		7
Chloromethane	CLME	74-87-3	4 00	140 00	=		28
Vinyl chloride	VC	75-01-4	4 00	150 00	=		25
Trichlorofluoromethane	FC11	75-69-4	3 00	150 00	=		27
1,1-Dichloroethene	DCE11	75-35-4	10 00	270 00	=		35
Trichlorotrifluoroethane	FC113	76-13-1	10 00	160 00	=		19
Methylene chloride	MTLNCL	75-09-2	3 00	220 00	=		12
trans-1,2-dichloroethene	DCE12T	156-60-5	4 00	220 00	=		11
1,1-Dichloroethane	DCA11	75-34-3	4 00	220 00	=		11
cis-1,2-dichloroethene	DCE12C	156-59-2	3 00	230 00	=		13
Chloroform	TCLME	67-66-3	4 00	220 00	=		9
1,1,1-Trichloroethane	TCA111	71-55-6	4 00	210 00	=		7
Carbon tetrachloride	CTCL	56-23-5	3 00	220 00	=		11
1,2-Dichloroethane	DCA12	107-06-2	3 00	220 00	=		10
Benzene	BZ	71-43-2	20.00	1100 00	=		11
Trichloroethene	TCE	79-01-6	3 00	230 00	=		14
Toluene	BZME	108-88-3	20 00	1100 00	=		8
Tetrachloroethene	PCE	127-18-4	3 00	220 00	=		11
Chlorobenzene	CLBZ	108-90-7	4 00	230 00	=		16
Ethylbenzene	EBZ	100-41-4	25 00	1100 00	=		6
m+p-Xylenes	XYLMP	1330-20-7	50 00	2000 00	=		1
o-Xylene	XYLO	95-47-6	25 00	1000 00	=		4
Bromochloromethane	BRCLME	74-97-5	0	96 24			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	105 08			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 08-Aug-97
Date Received: N/A
Date Analyzed: 08-Aug-97
Time Analyzed: 1339
Date Reported: 05-Sep-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 001F0101.D
Electronic Filename: 201D0808.QAC
SACODE: RM2
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	190.00	=		3
Chloromethane	CLME	74-87-3	4.00	150.00	=		26
Vinyl chloride	VC	75-01-4	4.00	140.00	=		30
Trichlorofluoromethane	FC11	75-69-4	3.00	180.00	=		12
1,1-Dichloroethene	DCE11	75-35-4	10.00	240.00	=		18
Trichlorotrifluoroethane	FC113	76-13-1	10.00	210.00	=		4
Methylene chloride	MTLNCL	75-09-2	3.00	230.00	=		15
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	230.00	=		16
1,1-Dichloroethane	DCA11	75-34-3	4.00	230.00	=		16
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	240.00	=		20
Chloroform	TCLME	67-66-3	4.00	230.00	=		14
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	220.00	=		12
Carbon tetrachloride	CTCL	56-23-5	3.00	240.00	=		19
1,2-Dichloroethane	DCA12	107-06-2	3.00	230.00	=		13
Benzene	BZ	71-43-2	20.00	1100.00	=		14
Trichloroethene	TCE	79-01-6	3.00	240.00	=		21
Toluene	BZME	108-88-3	20.00	1100.00	=		12
Tetrachloroethene	PCE	127-18-4	3.00	230.00	=		17
Chlorobenzene	CLBZ	108-90-7	4.00	240.00	=		20
Ethylbenzene	EBZ	100-41-4	25.00	1100.00	=		8
m+p-Xylenes	XYLMP	1330-20-7	50.00	2100.00	=		4
o-Xylene	XYLO	95-47-6	25.00	1000.00	=		5
Bromochloromethane	BRCLME	74-97-5	0	98.91			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	103.81			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gareth Voight Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 8021

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: N/A
Date Analyzed: 08-Aug-97
Time Analyzed: 1422
Date Reported: 05-Sep-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: METHOD BLANK
Sample Volume (ml): 50
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0808A2
Data Filename: 002F0101.D
Electronic Filename: 202D0808.QAC
SACODE: LB2
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4 00	0	U		
Chloromethane	CLME	74-87-3	4 00	0	U		
Vinyl chloride	VC	75-01-4	4 00	0	U		
Trichlorofluoromethane	FC11	75-69-4	3 00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	10 00	0	U		
Trichlorotrifluoroethane	FC113	76-13-1	10 00	0	U		
Methylene chloride	MTLNCL	75-09-2	3 00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	4 00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	4 00	0	U		
cis-1,2-dichloroethene	DCE12C	156-59-2	3 00	0	U		
Chloroform	TCLME	67-66-3	4 00	0	U		
1,1,1-Trichloroethane	TCA111	71-55-6	4 00	0	U		
Carbon tetrachloride	CTCL	56-23-5	3 00	0	U		
1,2-Dichloroethane	DCA12	107-06-2	3 00	0	U		
Benzene	BZ	71-43-2	20 00	0	U		
Trichloroethene	TCE	79-01-6	3 00	0	U		
Toluene	BZME	108-88-3	20 00	0	U		
Tetrachloroethene	PCE	127-18-4	3 00	0	U		
Chlorobenzene	CLBZ	108-90-7	4 00	0	U		
Ethylbenzene	EBZ	100-41-4	25 00	0	U		
m+p-Xylenes	XYLMP	1330-20-7	50 00	0	U		
o-Xylene	XYLO	95-47-6	25 00	0	U		
Bromochloromethane	BRCLME	74-97-5	0	90 55			
1,4-Dichlorobutane	DCBTA14	110-56-5	0	97 71			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 5 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Methods 18 Modified

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 08-Aug-97
Date Received: N/A
Date Analyzed: 08-Aug-97
Time Analyzed: 1334
Date Reported: 09-Sep-97
Dilution Factor: 1.00
Concentration Units: PPMV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 2.0ML S8073
Sample Volume (ml): 2.0
Initial Calibration Date: 24-Jul-95
QC Batch Code: 8D0808A3
Data Filename: 001F0101.D
Electronic Filename: 101D0808.QAC
SACODE: RMN
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Methane	CH4	74-82-8	200.00	1100.00	=		7

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPMV - Parts per million volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.

PROCEDURES:
This analysis was performed using EPA Method 18 modified.

Approved By: Gosia Voigt Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	62400	**Field ID #:**	N/A
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	N/A
Sample Type:	AIR/STANDARD	**Lab Sample ID:**	2.0UL S8024
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	2.0
Date Received:	N/A	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1357	**Data Filename:**	002F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	202D0808.QAC
Dilution Factor:	1.00	**SACODE:**	RMO
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Methane	CH4	74-82-8	200.00	0	U		100

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits. 65 to 135%

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voigt Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	62400	**Field ID #:**	N/A
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	N/A
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	METHOD BLANK
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	2
Date Received:	N/A	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1417	**Data Filename:**	003F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	103D0808.QAC
Dilution Factor:	1.00	**SACODE:**	LBA
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-80-2	200.00	0	U		

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gavin Voigt Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #: 62400
Client: Harding Lawson Assoc.
Chain-of Custody #:
Sample Type: AIR / TEDLAR
Date Sampled: 08-Aug-97
Date Received: N/A
Date Analyzed: 08-Aug-97
Time Analyzed: 1618
Date Reported: 12-Aug-97
Dilution Factor: 1.00
Concentration Units: PPMV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 2.0ML S8073
Sample Volume (ml): 2.0
Initial Calibration Date: 24-Jul-95
QC Batch Code: 8D0808A3
Data Filename: 008F0101.D
Electronic Filename: 108D0808.QAC
SACODE: RMP
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Methane	CH4	74-82-8	200 00	1100 00	=		12

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits 65 to 135%

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 Modified

Project #:	62400	**Field ID #:**	FBAI02
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:	0000	**Sample Delivery Group:**	8D277
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D27719
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	5
Date Received:	08-Aug-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1447	**Data Filename:**	004F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	104D0808.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-80-2	80.00	3900.00	=		

NOTES:

R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:

This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	62400	**Field ID #:**	FBAE01
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:	N/A	**Sample Delivery Group:**	8D277
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D27720
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	5
Date Received:	08-Aug-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1513	**Data Filename:**	005F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	105D0808.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-80-2	80.00	2400.00	=		

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	62400	**Field ID #:**	FBAD01
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:		**Sample Delivery Group:**	8D277
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D27721
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	5
Date Received:	08-Aug-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1533	**Data Filename:**	006F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	106D0808.HAL
Dilution Factor:	0.40	**SACODE:**	*
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compound	NMOC	0-80-2	80.00	1200.00	=		

NOTES:

R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%.

PROCEDURES:

This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: Gareth Voigt Date: SEP - 8 1997

ONSITE
ENVIRONMENTAL
LABORATORIES, INC.

Analytical Laboratory Report

EPA Method 18 modified

Project #:	62400	**Field ID #:**	FBAI02
Client:	Harding Lawson Assoc.	**Site #:**	N/A
Chain-of Custody #:		**Sample Delivery Group:**	8D277
Sample Type:	AIR / TEDLAR	**Lab Sample ID:**	8D27719
Date Sampled:	08-Aug-97	**Sample Volume (ml):**	5
Date Received:	08-Aug-97	**Initial Calibration Date:**	24-Jul-95
Date Analyzed:	08-Aug-97	**QC Batch Code:**	8D0808A3
Time Analyzed:	1554	**Data Filename:**	007F0101.D
Date Reported:	12-Aug-97	**Electronic Filename:**	107D0808.QAC
Dilution Factor:	0.40	**SACODE:**	LRA
Concentration Units:	PPMV	**PVCCODE:**	PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / PD
Non-methane organic compounds	NMOC	0-80-2	80 00	3700 00	=		5

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits: 65 to 135%

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030

Approved By: Gareth Voight Date: SEP - 8 1997

HLA
Sacramento, California 95827
916/364-0793
Telecopy: 916/364-5633

CA

Lab:

Samplers: Dan Gwaltney

Job Number: 37478 35

Name/Location: McClellan FBAS

Project Manager: Mike Sides

Recorder: (Signature Required)

SOURCE CODE	MATRIX: Gas	Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr Wk Seq	DATE: Yr Mo Dy Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	EPA 8021 mod.	EPA modified
60	X					X			FBAI-02	080797 1105	BD277-19							X	X
↓	↓					↓			FBAE-01	↓ 1100	-20							↓	↓
									FBAD-01	1105	-21								

LAB NUMBER: Yr Wk Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Dan Gwaltney	RECEIVED BY: (Signature) Gregg Kopp	DATE/TIME 8/8/97 1215
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
METHOD OF SHIPMENT		

Laboratory Copy Project Office Copy Field Office Copy

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 17-Jul-97
Date Received: N/A
Date Analyzed: 17-Jul-97
Time Analyzed: 0904
Date Reported: 17-Jul-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0717A2
Data Filename: 001F0101.D
Electronic Filename: 201D0717.QAC
SACODE: KM2
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	LAB USE	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	230.00	=		13
Chloromethane	CLME	74-87-3	6.00	160.00	=		21
Vinyl chloride	VC	75-01-4	4.00	160.00	=		22
Trichlorofluoromethane	FC11	75-69-4	3.00	210.00	=		4
1,1-Dichloroethene	DCE11	75-35-4	10.00	240.00	=		18
Trichlorotrifluoroethane	FC113	76-13-1	10.00	240.00	=		28
Methylene chloride	MTLNCL	75-09-2	3.00	240.00	=		29
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	250.00	=		23
1,1-Dichloroethane	DCA11	75-34-3	4.00	250.00	=		23
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	240.00	=		22
Chloroform	TCLME	67-66-3	4.00	230.00	=		15
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	230.00	=		15
Carbon tetrachloride	CTCL	56-23-5	3.00	240.00	=		30
1,2-Dichloroethane	DCA12	107-06-2	3.00	230.00	=		17
Benzene	BZ	71-43-2	20.00	1200.00	=		22
Trichloroethene	TCE	79-01-6	3.00	250.00	=		24
Toluene	BZME	108-88-3	20.00	1200.00	=		18
Tetrachloroethene	PCE	127-18-4	3.00	240.00	=		19
Chlorobenzene	CLBZ	108-90-7	4.00	240.00	=		21
Ethylbenzene	EBZ	100-41-4	25.00	1100.00	=		13
m+p-Xylenes	XYLMP	1330-20-7	50.00	2200.00	=		9
o-Xylene	XYLO	95-47-6	25.00	1100.00	=		10
Bromochloromethane	BRCLME	74-97-5		88.38			
1,4-Dichlorobutane	DCBTA14	110-56-5		105.08			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analyte not detected at or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume
MQL - Method quantitation limit.
PD - Percent difference
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: ____________

Date: 3/15/98

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 17-Jul-97
Date Received: N/A
Date Analyzed: 17-Jul-97
Time Analyzed: 0937
Date Reported: 17-Jul-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: METHOD BLANK
Sample Volume (ml): 50
Initial Calibration Date: 01-May-97
QC Batch Code: ID0717A2
Data Filename: 002F0101.D
Electronic Filename: 202D0717.QAC
SACODE: LB2
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	UNS USR	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	4.00	0	U		
Chloromethane	CLME	74-87-3	4.00	0	U		
Vinyl chloride	VC	75-01-4	4.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	3.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	10.00	0	U		
Trichlorotrifluoroethane	FC113	76-13-1	10.00	0	U		
Methylene chloride	MTLNCL	75-09-2	3.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	4.00	0	U		
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	0	U		
Chloroform	TCLME	67-66-3	4.00	0	U		
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	0	U		
Carbon tetrachloride	CTCL	56-23-5	3.00	0	U		
1,2-Dichloroethane	DCA12	107-06-2	3.00	0	U		
Benzene	BZ	71-43-2	20.00	0	U		
Trichloroethene	TCE	79-01-6	3.00	0	U		
Toluene	TOLUENE	108-88-3	20.00	0	U		
Tetrachloroethene	PCE	127-18-4	3.00	0	U		
Chlorobenzene	CLBZ	108-90-7	4.00	0	U		
Ethylbenzene	EBZ	100-41-4	25.00	0	U		
m+p-Xylenes	XYLMP	1330-20-7	50.00	0	U		
o-Xylene	XYLO	95-47-6	25.00	0	U		
Bromochloromethane	BRCLME	74-97-5		82.55			
1,4-Dichlorobutane	DCBTA14	110-56-5		102.99			

NOTES:
A - Data rejected.
E - Data estimated due to exceedance of calibration range
D - Dilution.
B - Blank contamination
U - Analytes not detected at, or above the stated detection limit
Q - [illegible] out of control limits
H - A result of zero represents an undetected result at the MQL reported and does not imply an actual value
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in terms of percent recovery with control limits: 65 to 139%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: _____ Date: 3/15/98

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 17-Jul-97
Date Received: 17-Jul-97
Date Analyzed: 17-Jul-97
Time Analyzed: 1123
Date Reported: 17-Jul-97
Dilution Factor: 100.00
Concentration Units: PPBV

Field ID #: FBA1-01
Site #: N/A
Sample Delivery Group: SD271
Lab Sample ID: SD27101
Sample Volume (ml): 0.5
Initial Calibration Date: 01-May-97
QC Batch Code: SD0717A2
Data Filename: 003F0101.D
Electronic Filename: 203D0717.HAL
SACODE: *
PVCCODE: PR

Analytes	FANLABEL	CASNUM	MQL	Results	FABVQ	UNS USK	RPD / PD
Dichlorodifluoromethane	FC12	75-71-8	600.00	0	U		
Chloromethane	CLME	74-87-3	400.00	0	U		
Vinyl chloride	VC	75-01-4	400.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	300.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	1000.00	0	U		
Trichlorotrifluoroethane	FC113	76-13-1	1000.00	1500.00	=		
Methylene chloride	MTLNCL	75-09-2	300.00	0	U		
trans-1,2-dichloroethene	DCE12T	156-60-5	400.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	400.00	2700.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	300.00	2100.00	=		
Chloroform	TCLME	67-66-3	400.00	2400.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	400.00	5400.00	=		
Carbon tetrachloride	CTCL	56-23-5	300.00	390.00	=		
1,2-Dichloroethane	DCA12	107-06-2	300.00	0	U		
Benzene	BZ	71-43-2	2000.00	28000.00	=		
Trichloroethene	TCE	79-01-6	300.00	23000.00	=		
Toluene	TOLUENE	108-88-3	2000.00	23000.00	=		
Tetrachloroethene	PCE	127-18-4	300.00	1500.00	=		
Chlorobenzene	CLBZ	108-90-7	400.00	0	U		
Ethylbenzene	EBZ	100-41-4	2500.00	7900.00	=		
m,p-Xylenes	XYLMP	1330-20-7	5000.00	5000.00	=		
o-Xylene	XYLO	95-47-6	2500.00	9700.00	=		
Bromochloromethane	BRCLME	74-97-5		81.92			
1,4-Dichlorobutane	DCBTA14	110-56-5		110.56			

NOTES:
R - Data rejected.
E - Data estimated due to exceedance of calibration range.
U - Undetected.
B - Blank contamination.
J - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
J - A result of zero represents an undetected result at the MQL reported and does not imply no actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate recoveries are in units of percent recovery with control limits of 80 to 120%.

PROCEDURES:
The analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: _____ Date: 3/15/98

Onsite Environmental Laboratories, Inc. 5300 Bennett Commons, Fremont, CA 94538 Tel: (510) 498-9571 Fax: (510) 490-8572

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 17-Jul-97
Date Received: 17-Jul-97
Date Analyzed: 17-Jul-97
Time Analyzed: 1222
Date Reported: 17-Jul-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBAI-01
Site #: N/A
Sample Delivery Group: SD271
Lab Sample ID: SD27101
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: SD0717A2
Data Filename: 004F0101.D
Electronic Filename: 204D0717.HAL
SACODE: *
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	User Use	RPD / FD
Dichlorodifluoromethane	FC12	75-71-8	80.00	0	U		
Chloromethane	CLME	74-87-3	80.00	0	U		
Vinyl chloride	VC	75-01-4	80.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200.00	2400.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	200.00	0	U		
Methylene chloride	MTLNCL	75-09-2	60.00	180.00	=		
trans-1,2-Dichloroethene	DCE12T	156-60-5	80.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80.00	3500.00	=		
cis-1,2-Dichloroethene	DCE12C	156-59-2	60.00	2800.00	=		
Chloroform	TCLME	67-66-3	80.00	2000.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	80.00	5000.00	=		
Carbon tetrachloride	CTCL	56-23-5	60.00	410.00	=		
1,2-Dichloroethane	DCA12	107-06-2	60.00	160.00	=		
Benzene	BZ	71-43-2	400.00	27000.00	=		
Trichloroethene	TCE	79-01-6	60.00	20000.00	=		
Toluene	TOLUE	108-88-3	400.00	1300.00	=		
Tetrachloroethene	PCE	127-18-4	60.00	1100.00	=		
Chlorobenzene	CLBZ	108-90-7	80.00	0	U		
Ethylbenzene	EBZ	100-41-4	500.00	11000.00	=		
m,p-Xylene	XYLMP	1330-20-7	1000.00	5700.00	=		
o-Xylene	XYLO	95-47-6	500.00	1200.00	=		
Bromochloromethane	BRCLME	74-97-5		86.32			
1,4-Dichlorobutane	DCBTA14	110-56-5		110.96			

NOTES:
B - Data rejected.
E - Data estimated due to exceedance of calibration range.
O - Unknown.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
0 - A result of zero represents an undetected result at the MQL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
FD - Process difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits 69 to 139%.

PROCEDURE:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: _____ Date: 3/15/98

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 17-Jul-97
Date Received: 17-Jul-97
Date Analyzed: 17-Jul-97
Time Analyzed: 1321
Date Reported: 17-Jul-97
Dilution Factor: 20.00
Concentration Units: PPBV

Field ID #: FBA1-01
Site #: N/A
Sample Delivery Group: 8D271
Lab Sample ID: 8D27101
Sample Volume (ml): 2.5
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0717A2
Data Filename: 005F0101.D
Electronic Filename: 205D0717.QAC
SACODE: LR2
PVCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	UBS UBE	RPD / PD
Dichlorodifluoromethane	FC13	75-71-8	80.00	0	U		
Chloromethane	CLME	74-87-3	80.00	0	U		
Vinyl chloride	VC	75-01-4	80.00	0	U		
Trichlorofluoromethane	FC11	75-69-4	60.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	200.00	3500.00	=		
Trichlorotrifluoroethane	FC113	76-13-1	200.00	0	U		
Methylene chloride	METLNCL	75-09-2	60.00	190.00	=		
trans-1,2-dichloroethene	DCE12T	156-60-5	80.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	80.00	3600.00	=		
cis-1,2-dichloroethene	DCE12C	156-59-2	60.00	2800.00	=		
Chloroform	TCLME	67-66-3	80.00	2000.00	=		
1,1,1-Trichloroethane	TCA111	71-55-6	80.00	5100.00	=		
Carbon tetrachloride	CTCL	56-23-5	60.00	420.00	=		
1,2-Dichloroethane	DLA12	107-06-2	60.00	160.00	=		
Benzene	BZ	71-43-2	400.00	27000.00	=		
Trichloroethene	TCE	79-01-6	60.00	20000.00	=		
Toluene	BZME	108-88-3	400.00	1300.00	=		
Tetrachloroethene	PCE	127-18-4	60.00	1100.00	=		
Chlorobenzene	CLBZ	108-90-7	80.00	0	U		
Ethylbenzene	EBZ	100-41-4	500.00	11000.00	=		
m+p-Xylenes	XYLMP	1330-20-7	1000.00	3700.00	=		
o-Xylene	XYLO	95-47-6	500.00	910.00	=		
Bromochloromethane	BRCLME	74-97-5		86.33			
1,4-Dichlorobutane	DCBTA14	110-56-5		109.34			

NOTES:
K - Data missed
L - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analyte was detected at, or above the stated detection limit.
Q - [illegible] out of control limits.
U - A result of zero represents an undetected result at the MDL required and does not imply an actual value.
PPBV - Parts per billion volume
MQL - Method quantitation limits.
PD - Percent difference.
RPD - Relative percent difference
Surrogate results are in terms of percent recovery with control limits 65 to 135%.

PROCEDURES:
This analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: _____ Date: 3/15/98

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / TEDLAR
Date Sampled: 17-Jul-97
Date Received: N/A
Date Analyzed: 17-Jul-97
Time Analyzed: 1412
Date Reported: 17-Jul-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: METHOD BLANK
Sample Volume (ml): 50
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0717A2
Data Filename: 006F0101.D
Electronic Filename: 206D0717.QAC
SACODE: LB4
PVCCODE: PR

Analyte	PARLABEL	CASNUM	MQL	Results	PARVQ	UBS USE	RPD / PD
Dichlorodifluoromethane	FCL2	75-71-8	4.00	0	U		
Chloromethane	CLME	74-87-3	4.00	0	U		
Vinyl chloride	VC	75-01-4	4.00	0	U		
Trichlorofluoromethane	FCL1	75-69-4	3.00	0	U		
1,1-Dichloroethene	DCE11	75-35-4	10.00	0	U		
Trichlorotrifluoroethane	FCL3	76-13-1	10.00	0	U		
Methylene chloride	MTLNCL	75-09-2	3.00	0	U		
trans-1,2-dichloroethene	DCE1T	156-60-5	4.00	0	U		
1,1-Dichloroethane	DCA11	75-34-3	4.00	0	U		
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	0	U		
Chloroform	TCLME	67-66-3	4.00	0	U		
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	0	U		
Carbon tetrachloride	CTCL	56-23-5	3.00	0	U		
1,2-Dichloroethane	DCA12	107-06-2	3.00	0	U		
Benzene	BZ	71-43-2	20.00	0	U		
Trichloroethene	TCE	79-01-6	3.00	0	U		
Toluene	BZME	108-88-3	20.00	0	U		
Tetrachloroethene	PCE	127-18-4	3.00	0	U		
Chlorobenzene	CLBZ	108-90-7	4.00	0	U		
	XBZ	108-41-8	25.00	0	U		
m+p-Xylenes	XYLMP	1330-20-7	50.00	0	U		
o-Xylene	XYLO	95-47-6	25.00	0	U		
Bromochloromethane	BRCLME	74-97-5		81.18			
1,4-Dichlorobutane	DCBTA14	110-56-5		108.33			

NOTES:
B - Data reported.
E - Data estimated due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analyte not detected at, or above the stated detection limit.
Q - parameter is out of control limits.
I - A result of zero represents an undetected result at the MDL reported and does not imply an actual value.
PPBV - Parts per billion volume
MDL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits of 60 to 135%.

PROCEDURES:
The analysis was performed using EPA Method 8021 and EPA Method 5030.

Approved By: _____ Date: 3/15/98

Analytical Laboratory Report

EPA Methods 8021

Project #: N/A
Client: Harding Lawson
Chain-of Custody #: N/A
Sample Type: AIR / STANDARD
Date Sampled: 17-Jul-97
Date Received: N/A
Date Analyzed: 17-Jul-97
Time Analyzed: 1445
Date Reported: 17-Jul-97
Dilution Factor: 1.00
Concentration Units: PPBV

Field ID #: N/A
Site #: N/A
Sample Delivery Group: N/A
Lab Sample ID: 5.0ML S8058
Sample Volume (ml): 5.0
Initial Calibration Date: 01-May-97
QC Batch Code: 8D0717A2
Data Filename: 007F0101.D
Electronic Filename: 207D0717.QAC
SACODE: RM4
PVCCODE: PR

Analytes	PARLABEL	CASNUM	MQL	Results	PARVQ	URS USE	RPD / FD
Dichlorodifluoromethane	FC12	75-71-8	4.00	220.00	=		18
Chloromethane	CLME	74-87-3	4.00	160.00	=		19
Vinyl chloride	VC	75-01-4	4.00	170.00	=		17
Trichlorofluoromethane	FC11	75-69-4	3.00	160.00	=		20
1,1-Dichloroethene	DCE11	75-35-4	10.00	230.00	=		15
Trichlorotrifluoroethane	FC113	76-13-1	10.00	240.00	=		19
Methylene chloride	MTLNCL	75-09-2	3.00	230.00	=		19
trans-1,2-dichloroethene	DCE12T	156-60-5	4.00	240.00	=		18
1,1-Dichloroethane	DCA11	75-34-3	4.00	230.00	=		17
cis-1,2-dichloroethene	DCE12C	156-59-2	3.00	230.00	=		17
Chloroform	TCLME	67-66-3	4.00	220.00	=		19
1,1,1-Trichloroethane	TCA111	71-55-6	4.00	220.00	=		21
Carbon tetrachloride	CTCL	56-23-5	3.00	230.00	=		15
1,2-Dichloroethane	DCA12	107-06-2	3.00	270.00	=		14
Benzene	BZ	71-43-2	20.00	1200.00	=		19
Trichloroethene	TCE	79-01-6	3.00	240.00	=		20
Toluene	BZME	108-88-3	20.00	1200.00	=		18
Tetrachloroethene	PCE	127-18-4	3.00	260.00	>		18
Chlorobenzene	CLBZ	108-90-7	4.00	240.00	=		21
Ethylbenzene	EBZ	100-41-4	25.00	1100.00	=		15
m+p-Xylenes	XYLMP	1330-20-7	50.00	2200.00	=		19
o-Xylene	XYLO	95-47-6	25.00	1100.00	=		19
Dichlorodifluoromethane	MNCLME	74-87-3		88.68			
1,4-Dichlorobutane	DCBTA14	110-56-5		113.09			

NOTES:
R - Data rejected.
C - Data quantified due to exceedance of calibration range.
D - Dilution.
B - Blank contamination.
U - Analytes not detected at, or above the stated detection limit.
Q - surrogate is out of control limits.
J - A result of zero represents an undetected result at the MDL reported and does not imply an actual value.
PPBV - Parts per billion volume.
MQL - Method quantitation limit.
PD - Percent difference.
RPD - Relative percent difference.
Surrogate results are in units of percent recovery with control limits 65 to 135%.

METHOD REFERENCE:
This analysis was performed using EPA Method 8021 and EPA Method 3030

Approved By: _____ Date: 3/15/98

Onsite Environmental Laboratories, Inc. 1500 Bancroft Corridor, Pleasant, CA 94534 Tel: (510) 680-0971 Fax (510) 680-5372

California Laboratory Services

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This report was sent automatically. In the event of an incomplete transmittance, 5 attempts will be made to send the complete number of pages for this report. If you have any questions, please call (916)638-7301 for assistance.

To: Alfonso Ang Date:7-28-97

From: California Laboratory Services Page 001 of 005

********** This report is also available via E-MAIL. **********
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* via e-mail directly to your desk. You may also request that *
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The following facsimile report is of a preliminary nature and as such does not include data that will be forthcoming in the complete report package. Interpretation of the report results should be made only after the complete report package has been delivered.

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/21/97
Date Analyzed: 07/21/97
Date Reported: 07/28/97
Client ID No.: RESIN-1

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: M8438-1A
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20072
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RESIN-1

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	5000	50
Benzene 71-43-2	26000	1000	200
Bromodichloromethane 75-27-4	ND	250	50
Bromoform 75-25-2	ND	250	50
Bromomethane 74-83-9	ND	500	50
2-Butanone 78-93-3	ND	5000	50
Carbon disulfide 75-15-0	420	250	50
Carbon tetrachloride 56-23-5	ND	250	50
Chlorobenzene 108-90-7	ND	250	50
Chloroethane 75-00-3	ND	500	50
Chloroform 67-66-3	ND	250	50
Chloromethane 74-87-3	ND	500	50
Dibromochloromethane 124-48-1	ND	250	50

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/21/97
Date Analyzed: 07/21/97
Date Reported: 07/28/97
Client ID No.: RESIN-1

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: N8438-1A
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20072
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RESIN-1(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Dibromomethane 74-95-3	ND	250	50
1,2-Dichlorobenzene 95-50-1	ND	250	50
1,3-Dichlorobenzene 541-73-1	ND	250	50
1,4-Dichlorobenzene 106-46-7	ND	250	50
Dichlorodifluoromethane 75-71-8	ND	500	50
1,1-Dichloroethane 75-34-3	ND	250	50
1,2-Dichloroethane 107-06-2	ND	250	50
1,1-Dichloroethene 75-35-4	ND	250	50
1,2-Dichloroethene, total 540-59-0	ND	250	50
1,2-Dichloropropane 78-87-5	ND	250	50
cis-1,3-Dichloropropene 10061-01-5	ND	250	50
trans-1,3-Dichloropropene 10061-02-6	ND	250	50
Ethylbenzene 100-41-4	ND	250	50

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/21/97
Date Analyzed: 07/21/97
Date Reported: 07/28/97
Client ID No.: RESIN-1

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: N8438-1A
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20072
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RESIN-1(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
2-Hexanone 591-78-6	ND	2500	50
Methylene chloride 75-09-2	ND	250	50
4-Methyl-2-pentanone 108-10-1	ND	2500	50
Styrene 100-42-5	ND	250	50
1,1,2,2-Tetrachloroethane 79-34-5	ND	250	50
Tetrachloroethene 127-18-4	ND	250	50
Toluene 108-88-3	1000	250	50
1,1,1-Trichloroethane 71-55-6	ND	250	50
1,1,2-Trichloroethane 79-00-5	ND	250	50
Trichloroethene 79-01-6	ND	250	50
Trichlorofluoromethane 75-69-4	ND	250	50
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	250	50
Vinyl acetate 108-05-4	ND	2500	50

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/21/97
Date Analyzed: 07/21/97
Date Reported: 07/28/97
Client ID No.: RESIN-1

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: M8438-1A
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20072
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RESIN-1(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Vinyl chloride 75-01-4	ND	500	50
Xylenes, total 1330-20-7	ND	500	50

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

California Laboratory Services

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To: [redacted] Date:7-18-97

From: California Laboratory Services Page 001 of 002

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Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 9

To Mike Sund	From A. Awk
Co. HLA	Co. [illegible]
Dept. —	Phone # (415)884-3544
Fax # (510)451-3165	Fax # (415)884-3300

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/18/97
Date Analyzed: 07/18/97
Date Reported: 07/18/97
Client ID No.: RESIN-1

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: N8438-1A
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20062
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

RESIN-1

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	ND	4.0	4.0

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

California Laboratory Services

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To: [redacted] Date:7-25-97

From: California Laboratory Services Page 001 of 002

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* you would like both fax and e-mail reports be sent. For more  *
* information, send an e-mail request to addme@clselis.com.     *
*****************************************************************
```

The following facsimile report is of a preliminary nature and as such does not include data that will be forthcoming in the complete report package. Interpretation of the report results should be made only after the complete report package has been delivered.

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client: Harding Lawson Associates
90 Digital Drive
Novato, CA 94949

Project: McClellan FBAS/IC-31

Date Sampled: 07/16/97
Date Received: 07/17/97
Date Extracted: 07/21/97
Date Analyzed: 07/24/97
Date Reported: 07/25/97

Project No.:
Contact: Alfonso Ang
Phone: (415)884-3121

Lab Contact: George Hampton
Lab ID No.: M8438
Job No.: 808438
COC Log No.: NO NUMBER
Batch No.: 20071
Instrument ID: PGC06
Analyst ID: SEPIDEHS
Matrix: SOLID

ANALYTICAL RESULTS

Lab / Client ID Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
1A / RESIN-1 TPH as Diesel	N/A	8.0	1.0	1.0

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

CLS Labs

Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

12/19/97

Attention: Mike Sides

Reference: Analytical Results

Project Name: McClellan FBAS
Project No.: 37478 35
Date Received: 12/03/97
Chain Of Custody: NO NUMBER

CLS ID No.: P0788
CLS Job No.: 810788

The following analyses were performed on the above referenced project:

No. of Samples	*Turnaround Time*	*Analysis Description*
5	10 Days	TPH Gasoline by DHS Method M8015 (soil)
2	10 Days	TPH Extractables by Method M8015 (soil)
5	10 Days	EPA Method 8240
1	10 Days	pH Analysis

TPH Extractable reporting limits were elevated due to high levels of lower range hydrocarbons present in the sample.

These samples were received by CLS Labs in a chilled, intact state and accompanied by a valid chain of custody document.

Calibrations for analytical testing have been performed in accordance to and pass the EPA's criteria for acceptability.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

George Hampton
Laboratory Director

3249 Fitzgerald Road Rancho Cordova, CA 95742 (916) 638-7301 Fax (916) 638-4510

CLS Labs

Analysis Report: **Total Petroleum Hydrocarbons, EPA Method 8015**
Purge and Trap, EPA Method 5030

Client: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

Project: **McClellan FBAS**

Date Sampled: **12/03/97**
Date Received: **12/03/97**
Date Extracted: **12/04/97**
Date Analyzed: **12/04/97**
Date Reported: **12/09/97**
Client ID No.: **ADSORB-101**

Project No.: **37478 35**
Contact: **Mike Sides**
Phone: **(916)364-0793**

Lab Contact: **George Hampton**
Lab ID No.: **P0788-1A**
Job No.: **810788**
COC Log No.: **NO NUMBER**
Batch No.: **21114**
Instrument ID: **GC018**
Analyst ID: **JENNDC**
Matrix: **SOLID**

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	151 MA

***Sample:* ADSORB-101**

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	730	200	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CLS Labs

Analysis Report: **Total Petroleum Hydrocarbons, EPA Method 8015**
Purge and Trap, EPA Method 5030

Client: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

Project: **McClellan FEAS**

Date Sampled: **12/03/97**
Date Received: **12/03/97**
Date Extracted: **12/04/97**
Date Analyzed: **12/04/97**
Date Reported: **12/09/97**
Client ID No.: **ADSORB-102**

Project No.: **37478 35**
Contact: **Mike Sides**
Phone: **(916)364-0793**

Lab Contact: **George Hampton**
Lab ID No.: **P0788-2A**
Job No.: **810788**
COC Log No.: **NO NUMBER**
Batch No.: **21114**
Instrument ID: **GC018**
Analyst ID: **JENNDC**
Matrix: **SOLID**

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	200	200 MA

Sample: ADSORB-102

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	10000	2000	2000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DCHS ELAP Accreditation/Registration Number 1233

CLS Labs

Analysis Report: **Total Petroleum Hydrocarbons, EPA Method 8015**
Purge and Trap, EPA Method 5030

Client: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

Project: **McClellan FBAS**

Date Sampled: **12/03/97**
Date Received: **12/03/97**
Date Extracted: **12/04/97**
Date Analyzed: **12/04/97**
Date Reported: **12/09/97**
Client ID No.: **DESORB-101**

Project No.: **37478 35**
Contact: **Mike Sides**
Phone: **(916)364-0793**

Lab Contact: **George Hampton**
Lab ID No.: **P0788-3A**
Job No.: **810788**
COC Log No.: **NO NUMBER**
Batch No.: **21114**
Instrument ID: **GC018**
Analyst ID: **JENNDC**
Matrix: **SOLID**

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	168 MA

***Sample:* DESORB-101**

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	790	200	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CLS Labs

Analysis Report: **Total Petroleum Hydrocarbons, EPA Method 8015**
Purge and Trap, EPA Method 5030

Client: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

Project: **McClellan FBAS**

Date Sampled: **12/03/97**
Date Received: **12/03/97**
Date Extracted: **12/04/97**
Date Analyzed: **12/04/97**
Date Reported: **12/09/97**
Client ID No.: **PCOND-101**

Project No.: **37478 35**
Contact: **Mike Sides**
Phone: **(916)364-0793**

Lab Contact: **George Hampton**
Lab ID No.: **P0788-4A**
Job No.: **810788**
COC Log No.: **NO NUMBER**
Batch No.: **21114**
Instrument ID: **GC018**
Analyst ID: **JENNDC**
Matrix: **OIL**

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	127 MA

Sample: PCOND-101

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	1400	200	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

CLS Labs

Analysis Report: **Total Petroleum Hydrocarbons, EPA Method 8015**
Purge and Trap, EPA Method 5030

Client: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

Project: **McClellan FBAS**

Date Sampled: **12/03/97**
Date Received: **12/03/97**
Date Extracted: **12/04/97**
Date Analyzed: **12/04/97**
Date Reported: **12/09/97**
Client ID No.: **PCOND-102**

Project No.: **37478 35**
Contact: **Mike Sides**
Phone: **(916)364-0793**

Lab Contact: **George Hampton**
Lab ID No.: **P0788-5A**
Job No.: **810788**
COC Log No.: **NO NUMBER**
Batch No.: **21114**
Instrument ID: **GC01S**
Analyst ID: **JENNDC**
Matrix: **OIL**

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	10000	190 MA

***Sample:* PCOND-102**

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	270000	100000	100000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

California Laboratory Services

Environmental Laboratory Information System

This report was sent automatically. In the event of an incomplete transmittance, 5 attempts will be made to send the complete number of pages for this report. If you have any questions, please call (916)638-7301 for assistance.

To: Mike Sides

Date:8-13-97

From: California Laboratory Services

Page 001 of 013

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********** This report is also available via E-MAIL. **********
* You may request individual or all reports also be sent to you *
* via e-mail directly to your desk. You may also request that   *
* you would like both fax and e-mail reports be sent. For more  *
* information, send an e-mail request to addme@clselis.com.     *
*****************************************************************
```

The following facsimile report is of a preliminary nature and as such does not include data that will be forthcoming in the complete report package. Interpretation of the report results should be made only after the complete report package has been delivered.

The high dilution on the TPH-MO was required because of the abundance of lower molecular weight hydrocarbons in the sample.

LAM

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: N8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ABSORB-01

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	1000000	10000
Benzene 71-43-2	ND	50000	10000
Bromodichloromethane 75-27-4	ND	50000	10000
Bromoform 75-25-2	ND	50000	10000
Bromomethane 74-83-9	ND	100000	10000
2-Butanone 78-93-3	ND	1000000	10000
Carbon disulfide 75-15-0	ND	50000	10000
Carbon tetrachloride 56-23-5	ND	50000	10000
Chlorobenzene 108-90-7	ND	50000	10000
Chloroethane 75-00-3	ND	100000	10000
Chloroform 67-66-3	92000	50000	10000
Chloromethane 74-87-3	ND	100000	10000
Dibromochloromethane 124-48-1	ND	50000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: N8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ABSORB-01(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Dibromomethane 74-95-3	ND	50000	10000
1,2-Dichlorobenzene 95-50-1	ND	50000	10000
1,3-Dichlorobenzene 541-73-1	ND	50000	10000
1,4-Dichlorobenzene 106-46-7	ND	50000	10000
Dichlorodifluoromethane 75-71-8	ND	100000	10000
1,1-Dichloroethane 75-34-3	120000	50000	10000
1,2-Dichloroethane 107-06-2	ND	50000	10000
1,1-Dichloroethene 75-35-4	ND	50000	10000
1,2-Dichloroethene, total 540-59-0	72000	50000	10000
1,2-Dichloropropane 78-87-5	ND	50000	10000
cis-1,3-Dichloropropene 10061-01-5	ND	50000	10000
trans-1,3-Dichloropropene 10061-02-6	ND	50000	10000
Ethylbenzene 100-41-4	ND	50000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: N8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ABSORB-01(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
2-Hexanone 591-78-6	ND	500000	10000
Methylene chloride 75-09-2	ND	50000	10000
4-Methyl-2-pentanone 108-10-1	ND	500000	10000
Styrene 100-42-5	ND	50000	10000
1,1,2,2-Tetrachloroethane 79-34-5	ND	50000	10000
Tetrachloroethene 127-18-4	ND	50000	10000
Toluene 108-88-3	ND	50000	10000
1,1,1-Trichloroethane 71-55-6	ND	50000	10000
1,1,2-Trichloroethane 79-00-5	ND	50000	10000
Trichloroethene 79-01-6	920000	50000	10000
Trichlorofluoromethane 75-69-4	ND	50000	10000
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	50000	10000
Vinyl acetate 108-05-4	ND	500000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ABSORB-01(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Vinyl chloride 75-01-4	ND	100000	10000
Xylenes, total 1330-20-7	ND	100000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: DESORB-03

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-2A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-03

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	1000000	10000
Benzene 71-43-2	ND	50000	10000
Bromodichloromethane 75-27-4	ND	50000	10000
Bromoform 75-25-2	ND	50000	10000
Bromomethane 74-83-9	ND	100000	10000
2-Butanone 78-93-3	ND	1000000	10000
Carbon disulfide 75-15-0	ND	50000	10000
Carbon tetrachloride 56-23-5	ND	50000	10000
Chlorobenzene 108-90-7	ND	50000	10000
Chloroethane 75-00-3	ND	100000	10000
Chloroform 67-66-3	66000	50000	10000
Chloromethane 74-87-3	ND	100000	10000
Dibromochloromethane 124-48-1	ND	50000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: DESORB-03

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-2A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-03(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Dibromomethane 74-95-3	ND	50000	10000
1,2-Dichlorobenzene 95-50-1	ND	50000	10000
1,3-Dichlorobenzene 541-73-1	ND	50000	10000
1,4-Dichlorobenzene 106-46-7	ND	50000	10000
Dichlorodifluoromethane 75-71-8	ND	100000	10000
1,1-Dichloroethane 75-34-3	86000	50000	10000
1,2-Dichloroethane 107-06-2	ND	50000	10000
1,1-Dichloroethene 75-35-4	ND	50000	10000
1,2-Dichloroethene, total 540-59-0	56000	50000	10000
1,2-Dichloropropane 78-87-5	ND	50000	10000
cis-1,3-Dichloropropene 10061-01-5	ND	50000	10000
trans-1,3-Dichloropropene 10061-02-6	ND	50000	10000
Ethylbenzene 100-41-4	ND	50000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: DESORB-03

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-2A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-03(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
2-Hexanone 591-78-6	ND	500000	10000
Methylene chloride 75-09-2	ND	50000	10000
4-Methyl-2-pentanone 108-10-1	ND	500000	10000
Styrene 100-42-5	ND	50000	10000
1,1,2,2-Tetrachloroethane 79-34-5	ND	50000	10000
Tetrachloroethene 127-18-4	ND	50000	10000
Toluene 108-88-3	ND	50000	10000
1,1,1-Trichloroethane 71-55-6	ND	50000	10000
1,1,2-Trichloroethane 79-00-5	ND	50000	10000
Trichloroethene 79-01-6	800000	50000	10000
Trichlorofluoromethane 75-69-4	ND	50000	10000
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	50000	10000
Vinyl acetate 108-05-4	ND	500000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/12/97
Date Analyzed: 08/12/97
Date Reported: 08/13/97
Client ID No.: DESORB-03

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-2A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20214
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-03(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Vinyl chloride 75-01-4	ND	100000	10000
Xylenes, total 1330-20-7	ND	100000	10000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/11/97
Date Analyzed: 08/13/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20206
Instrument ID: PGC04
Analyst ID: SEPIDEHS
Matrix: SOLID

ABSORB-01

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Diesel	N/A	ND	100	100
TPH as Motor Oil	N/A	ND	200	100

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/11/97
Date Analyzed: 08/13/97
Date Reported: 08/13/97
Client ID No.: DESORB-03

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-2A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20206
Instrument ID: PGC04
Analyst ID: SEPIDEHS
Matrix: SOLID

DESORB-03

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Diesel	N/A	ND	50	100
TPH as Motor Oil	N/A	ND	100	100

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10265 Rockingham Dr. STE 150
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 08/08/97
Date Received: 08/08/97
Date Extracted: 08/11/97
Date Analyzed: 08/11/97
Date Reported: 08/13/97
Client ID No.: ABSORB-01

Project No.: 3747835
Contact:
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: M8751-1A
Job No.: 808751
COC Log No.: NO NUMBER
Batch No.: 20202
Instrument ID: GC018
Analyst ID: JENMDC
Matrix: SOLID

ABSORB-01

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	15000	5000	5000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client:	Harding Lawson Associates 10265 Rockingham Dr. STE 150 Sacramento, CA 95827	Project No.:	3747835
		Contact:	
		Phone:	(916)364-0793
Project:	McClellan FBAS	Lab Contact:	George Hampton
		Lab ID No.:	M8751-2A
Date Sampled:	08/08/97	Job No.:	808751
Date Received:	08/08/97	COC Log No.:	NO NUMBER
Date Extracted:	08/11/97	Batch No.:	20202
Date Analyzed:	08/11/97	Instrument ID:	GC018
Date Reported:	08/13/97	Analyst ID:	JENNDC
Client ID No.:	DESORB-03	Matrix:	SOLID

DESORB-03

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	9700	2000	2000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

CLS Labs

ANALYSIS REPORT: Tentatively Identified Compounds EPA METHOD: 8240

CLIENT: Harding Lawson Associates
10265 Rockingham Dr, STE 150
Sacramento, CA 95827

PROJECT NO.: 3747835
CONTACT: Mike Sides
PHONE: 916-364-0793

PROJECT: McClellan FBAS

CLS CONTACT: Larry Mooney
JOB NO.: 808751
COC LOG NO.:
CLS ID NO.: N8751
BATCH NO.: 20214
MATRIX: SOLID

DATE RECEIVED: 8/8/97
DATE ANALYZED: 8/12/97

CLIENT ID: ABSORB-01

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (ug/Kg)
13.62	Hexane, 2,3-dimethyl-	380000
13.92	Pentane, 2,3,3-trimethyl-	540000
14.51	Hexane, 2,2,5-trimethyl-	1180000
15.89	Hexane, 2,3,5-trimethyl-	410000
17.92	Heptane, 2,2,4-trimethyl-	750000
18.17	Decane, 2,2,6-trimethyl-	1980000
18.65	Heptane, 3,3,5-trimethyl-	1060000
19.11	Octane, 2,3-dimethyl-	570000
20.19	Unknown Alkane	3800000
20.56	Octane, 2,2,6-trimethyl-	760000

3249 Fitzgerald Road
Rancho Cordova, CA 95742
(916) 638-7301
Fax (916) 638-4510

3083 Gold Canal Drive
Rancho Cordova, CA 956
(916) 852-8600
Fax (916) 852-7292

CLS Labs

ANALYSIS REPORT: Tentatively Identified Compounds

EPA METHOD: 8240

CLIENT: Harding Lawson Associates
10265 Rockingham Dr, STE 150
Sacramento, CA 95827

PROJECT NO.: 3747835
CONTACT: Mike Sides
PHONE: 916-364-0793

PROJECT: McClellan FBAS

CLS CONTACT: Larry Mooney
JOB NO.: 808751
COC LOG NO.:
CLS ID NO.: N8751
BATCH NO.: 20214
MATRIX: SOLID

DATE RECEIVED: 8/8/97
DATE ANALYZED: 8/12/97

CLIENT ID: DESORB-03

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (ug/Kg)
12.60	Octane, 4-ethyl-	350000
13.81	Pentane, 2,3,4-trimethyl-	280000
13.93	Pentane, 2,3,3-trimethyl-	380000
14.56	Hexane, 2,2,4-trimethyl-	680000
17.93	Hexane, 2,2,5-trimethyl-	340000
18.21	Heptane, 2,2,4-trimethyl-	730000
18.67	Heptane, 3,3,5-trimethyl-	400000
20.21	Octane, 2,2,6-trimethyl-	1800000
20.60	Unknown Alkane	410000
21.91	Decane, 2,2-dimethyl-	280000

3249 Fitzgerald Road
Rancho Cordova, CA 95742
(916) 638-7301
Fax (916) 638-4510

3083 Gold Canal Drive
Rancho Cordova, CA 95670
(916) 852-8800
Fax (916) 852-7292

CLS Labs

Environmental
Laboratory
Information
System

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To: Alfonso Ang

Date:6-19-98

From: CLS Labs

Page 001 of 045

********** This report is also available via E-MAIL. **********
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* via e-mail directly to your desk. You may also request that *
* you would like both fax and e-mail reports be sent. For more *
* information, send an e-mail request to addme@clselis.com. *
****

The following facsimile report is of a final nature in fax format and as such does not include data that will be forthcoming in the complete report package. Interpretation of the report results should be made only after the complete report package has been delivered.

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-1A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	25000	97
Toluene-d8	N/A	25000	98
p-Bromofluorobenzene	460-00-4	25000	84

ADSORB-101

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	25000	250
Benzene 71-43-2	2600	1200	250
Bromodichloromethane 75-27-4	ND	1200	250
Bromoform 75-25-2	ND	1200	250
Bromomethane 74-83-9	ND	2500	250
2-Butanone 78-93-3	ND	25000	250
Carbon disulfide 75-15-0	ND	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-1A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	1200	250
Chlorobenzene 108-90-7	ND	1200	250
Chloroethane 75-00-3	ND	2500	250
2-Chloroethyl vinyl ether 110-75-8	ND	12000	250
Chloroform 67-66-3	3700	1200	250
Chloromethane 74-87-3	ND	2500	250
Dibromochloromethane 124-48-1	ND	1200	250
Dibromomethane 74-95-3	ND	1200	250
1,2-Dichlorobenzene 95-50-1	ND	1200	250
1,3-Dichlorobenzene 541-73-1	ND	1200	250
1,4-Dichlorobenzene 106-46-7	ND	1200	250
Dichlorodifluoromethane 75-71-8	ND	2500	250
1,1-Dichloroethane 75-34-3	8000	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
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Date Reported: 06/19/98
Client ID No.: ADSORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-1A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	1200	250
1,1-Dichloroethene 75-35-4	ND	1200	250
1,2-Dichloroethene, total 540-59-0	4200	1200	250
1,2-Dichloropropane 78-87-5	ND	1200	250
cis-1,3-Dichloropropene 10061-01-5	ND	1200	250
trans-1,3-Dichloropropene 10061-02-6	ND	1200	250
Ethylbenzene 100-41-4	ND	1200	250
2-Hexanone 591-78-6	ND	12000	250
Methylene chloride 75-09-2	ND	1200	250
4-Methyl-2-pentanone 108-10-1	ND	12000	250
Styrene 100-42-5	ND	1200	250
1,1,2,2-Tetrachloroethane 79-34-5	ND	1200	250
Tetrachloroethene 127-18-4	14000	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

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Client ID No.: ADSORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-1A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	3600	1200	250
1,1,1-Trichloroethane 71-55-6	ND	1200	250
1,1,2-Trichloroethane 79-00-5	ND	1200	250
Trichloroethene 79-01-6	160000	5000	1000
Trichlorofluoromethane 75-69-4	ND	1200	250
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	1200	250
Vinyl acetate 108-05-4	ND	12000	250
Vinyl chloride 75-01-4	ND	2500	250
Xylenes, total 1330-20-7	ND	2500	250

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-2A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	250000	105
Toluene-d8	N/A	250000	102
p-Bromofluorobenzene	460-00-4	250000	99

ADSORB-102

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	250000	2500
Benzene 71-43-2	ND	12000	2500
Bromodichloromethane 75-27-4	ND	12000	2500
Bromoform 75-25-2	ND	12000	2500
Bromomethane 74-83-9	ND	25000	2500
2-Butanone 78-93-3	ND	250000	2500
Carbon disulfide 75-15-0	ND	12000	2500

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-2A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	12000	2500
Chlorobenzene 108-90-7	ND	12000	2500
Chloroethane 75-00-3	ND	25000	2500
2-Chloroethyl vinyl ether 110-75-8	ND	120000	2500
Chloroform 67-66-3	ND	12000	2500
Chloromethane 74-87-3	ND	25000	2500
Dibromochloromethane 124-48-1	ND	12000	2500
Dibromomethane 74-95-3	ND	12000	2500
1,2-Dichlorobenzene 95-50-1	ND	12000	2500
1,3-Dichlorobenzene 541-73-1	ND	12000	2500
1,4-Dichlorobenzene 106-46-7	ND	12000	2500
Dichlorodifluoromethane 75-71-8	ND	25000	2500
1,1-Dichloroethane 75-34-3	45000	12000	2500

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

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Date Received: 12/03/97
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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-2A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	12000	2500
1,1-Dichloroethene 75-35-4	ND	12000	2500
1,2-Dichloroethene, total 540-59-0	28000	12000	2500
1,2-Dichloropropane 78-87-5	ND	12000	2500
cis-1,3-Dichloropropene 10061-01-5	ND	12000	2500
trans-1,3-Dichloropropene 10061-02-6	ND	12000	2500
Ethylbenzene 100-41-4	ND	12000	2500
2-Hexanone 591-78-6	ND	120000	2500
Methylene chloride 75-09-2	ND	12000	2500
4-Methyl-2-pentanone 108-10-1	ND	120000	2500
Styrene 100-42-5	ND	12000	2500
1,1,2,2-Tetrachloroethane 79-34-5	ND	12000	2500
Tetrachloroethene 127-18-4	28000	12000	2500

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Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: ADSORB-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-2A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	ND	12000	2500
1,1,1-Trichloroethane 71-55-6	ND	12000	2500
1,1,2-Trichloroethane 79-00-5	ND	12000	2500
Trichloroethene 79-01-6	340000	12000	2500
Trichlorofluoromethane 75-69-4	ND	12000	2500
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	12000	2500
Vinyl acetate 108-05-4	ND	120000	2500
Vinyl chloride 75-01-4	ND	25000	2500
Xylenes, total 1330-20-7	ND	25000	2500

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: DESORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-3A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	25000	101
Toluene-d8	N/A	25000	100
p-Bromofluorobenzene	460-00-4	25000	104

DESORB-101

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	25000	250
Benzene 71-43-2	1900	1200	250
Bromodichloromethane 75-27-4	ND	1200	250
Bromoform 75-25-2	ND	1200	250
Bromomethane 74-83-9	ND	2500	250
2-Butanone 78-93-3	ND	25000	250
Carbon disulfide 75-15-0	ND	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: DESORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-3A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	1200	250
Chlorobenzene 108-90-7	ND	1200	250
Chloroethane 75-00-3	ND	2500	250
2-Chloroethyl vinyl ether 110-75-8	ND	12000	250
Chloroform 67-66-3	2600	1200	250
Chloromethane 74-87-3	ND	2500	250
Dibromochloromethane 124-48-1	ND	1200	250
Dibromomethane 74-95-3	ND	1200	250
1,2-Dichlorobenzene 95-50-1	ND	1200	250
1,3-Dichlorobenzene 541-73-1	ND	1200	250
1,4-Dichlorobenzene 106-46-7	ND	1200	250
Dichlorodifluoromethane 75-71-8	ND	2500	250
1,1-Dichloroethane 75-34-3	3800	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: DESORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-3A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	1200	250
1,1-Dichloroethene 75-35-4	ND	1200	250
1,2-Dichloroethene, total 540-59-0	2600	1200	250
1,2-Dichloropropane 78-87-5	ND	1200	250
cis-1,3-Dichloropropene 10061-01-5	ND	1200	250
trans-1,3-Dichloropropene 10061-02-6	ND	1200	250
Ethylbenzene 100-41-4	ND	1200	250
2-Hexanone 591-78-6	ND	12000	250
Methylene chloride 75-09-2	ND	1200	250
4-Methyl-2-pentanone 108-10-1	ND	12000	250
Styrene 100-42-5	ND	1200	250
1,1,2,2-Tetrachloroethane 79-34-5	ND	1200	250
Tetrachloroethene 127-18-4	15000	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
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Sacramento, CA 95827

Project: McClellan FBAS

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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: DESORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-3A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

DESORB-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	3300	1200	250
1,1,1-Trichloroethane 71-55-6	ND	1200	250
1,1,2-Trichloroethane 79-00-5	ND	1200	250
Trichloroethene 79-01-6	130000	5000	1000
Trichlorofluoromethane 75-69-4	ND	1200	250
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	1200	250
Vinyl acetate 108-05-4	ND	12000	250
Vinyl chloride 75-01-4	ND	2500	250
Xylenes, total 1330-20-7	ND	2500	250

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: PCOND-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-4A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	25000	110
Toluene-d8	N/A	25000	99
p-Bromofluorobenzene	460-00-4	25000	77

PCOND-101

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	25000	250
Benzene 71-43-2	55000	1200	250
Bromodichloromethane 75-27-4	ND	1200	250
Bromoform 75-25-2	ND	1200	250
Bromomethane 74-83-9	ND	2500	250
2-Butanone 78-93-3	ND	25000	250
Carbon disulfide 75-15-0	ND	1200	250

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
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Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: PCOND-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-4A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

PCOND-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	1200	250
Chlorobenzene 108-90-7	ND	1200	250
Chloroethane 75-00-3	ND	2500	250
2-Chloroethyl vinyl ether 110-75-8	ND	12000	250
Chloroform 67-66-3	240000	50000	10000
Chloromethane 74-87-3	ND	2500	250
Dibromochloromethane 124-48-1	ND	1200	250
Dibromomethane 74-95-3	ND	1200	250
1,2-Dichlorobenzene 95-50-1	ND	1200	250
1,3-Dichlorobenzene 541-73-1	ND	1200	250
1,4-Dichlorobenzene 106-46-7	ND	1200	250
Dichlorodifluoromethane 75-71-8	ND	2500	250
1,1-Dichloroethane 75-34-3	190000	50000	10000

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Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
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Date Reported: 06/19/98
Client ID No.: PCOND-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-4A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

PCOND-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	1200	250
1,1-Dichloroethene 75-35-4	9700	1200	250
1,2-Dichloroethene, total 540-59-0	260000	50000	10000
1,2-Dichloropropane 78-87-5	ND	1200	250
cis-1,3-Dichloropropene 10061-01-5	ND	1200	250
trans-1,3-Dichloropropene 10061-02-6	ND	1200	250
Ethylbenzene 100-41-4	ND	1200	250
2-Hexanone 591-78-6	ND	12000	250
Methylene chloride 75-09-2	3900	1200	250
4-Methyl-2-pentanone 108-10-1	ND	12000	250
Styrene 100-42-5	ND	1200	250
1,1,2,2-Tetrachloroethane 79-34-5	ND	1200	250
Tetrachloroethene 127-18-4	460000	50000	10000

ND = Not detected at or above indicated Reporting Limit

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Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

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Client ID No.: PCOND-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-4A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

PCOND-101(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	20000	1200	250
1,1,1-Trichloroethane 71-55-6	50000	1200	250
1,1,2-Trichloroethane 79-00-5	ND	1200	250
Trichloroethene 79-01-6	7800000	50000	10000
Trichlorofluoromethane 75-69-4	ND	1200	250
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	1200	250
Vinyl acetate 108-05-4	ND	12000	250
Vinyl chloride 75-01-4	ND	2500	250
Xylenes, total 1330-20-7	ND	2500	250

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: PCOND-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-5A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	10000000	102
Toluene-d8	N/A	10000000	100
p-Bromofluorobenzene	460-00-4	10000000	94

PCOND-102

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	10000000	100000
Benzene 71-43-2	ND	500000	100000
Bromodichloromethane 75-27-4	ND	500000	100000
Bromoform 75-25-2	ND	500000	100000
Bromomethane 74-83-9	ND	1000000	100000
2-Butanone 78-93-3	ND	10000000	100000
Carbon disulfide 75-15-0	ND	500000	100000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: PCOND-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-5A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

PCOND-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	500000	100000
Chlorobenzene 108-90-7	ND	500000	100000
Chloroethane 75-00-3	ND	1000000	100000
2-Chloroethyl vinyl ether 110-75-8	ND	5000000	100000
Chloroform 67-66-3	ND	500000	100000
Chloromethane 74-87-3	ND	1000000	100000
Dibromochloromethane 124-48-1	ND	500000	100000
Dibromomethane 74-95-3	ND	500000	100000
1,2-Dichlorobenzene 95-50-1	ND	500000	100000
1,3-Dichlorobenzene 541-73-1	ND	500000	100000
1,4-Dichlorobenzene 106-46-7	ND	500000	100000
Dichlorodifluoromethane 75-71-8	ND	1000000	100000
1,1-Dichloroethane 75-34-3	ND	500000	100000

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client:	Harding Lawson Associates 10324 Placer Lane Sacramento, CA 95827	Project No.:	37478 35
		Contact:	Mike Sides
		Phone:	(916)364-0793
Project:	McClellan FBAS	Lab Contact:	George Hampton
		Lab ID No.:	P0788-5A
Date Sampled:	12/03/97	Job No.:	810788
Date Received:	12/03/97	COC Log No.:	NO NUMBER
Date Extracted:	12/10/97	Batch No.:	21147
Date Analyzed:	12/10/97	Instrument ID:	MS02
Date Reported:	06/19/98	Analyst ID:	MARKW
Client ID No.:	PCOND-102	Matrix:	OIL

PCOND-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	500000	100000
1,1-Dichloroethene 75-35-4	ND	500000	100000
1,2-Dichloroethene, total 540-59-0	ND	500000	100000
1,2-Dichloropropane 78-87-5	ND	500000	100000
cis-1,3-Dichloropropene 10061-01-5	ND	500000	100000
trans-1,3-Dichloropropene 10061-02-6	ND	500000	100000
Ethylbenzene 100-41-4	ND	500000	100000
2-Hexanone 591-78-6	ND	5000000	100000
Methylene chloride 75-09-2	ND	500000	100000
4-Methyl-2-pentanone 108-10-1	ND	5000000	100000
Styrene 100-42-5	ND	500000	100000
1,1,2,2-Tetrachloroethane 79-34-5	ND	500000	100000
Tetrachloroethene 127-18-4	1100000	500000	100000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98
Client ID No.: PCOND-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-5A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: OIL

PCOND-102(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	ND	500000	100000
1,1,1-Trichloroethane 71-55-6	ND	500000	100000
1,1,2-Trichloroethane 79-00-5	ND	500000	100000
Trichloroethene 79-01-6	9300000	500000	100000
Trichlorofluoromethane 75-69-4	ND	500000	100000
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	500000	100000
Vinyl acetate 108-05-4	ND	5000000	100000
Vinyl chloride 75-01-4	ND	1000000	100000
Xylenes, total 1330-20-7	ND	1000000	100000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MB SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	MB Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	99
Toluene-d8	N/A	100	104
p-Bromofluorobenzene	460-00-4	100	99

METHOD BLANK

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
Acetone	67-64-1	ND	100
Benzene	71-43-2	ND	5.0
Bromodichloromethane	75-27-4	ND	5.0
Bromoform	75-25-2	ND	5.0
Bromomethane	74-83-9	ND	10
2-Butanone	78-93-3	ND	100
Carbon disulfide	75-15-0	ND	5.0
Carbon tetrachloride	56-23-5	ND	5.0
Chlorobenzene	108-90-7	ND	5.0
Chloroethane	75-00-3	ND	10
2-Chloroethyl vinyl ether	110-75-8	ND	50

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

METHOD BLANK(cont.)

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
Chloroform	67-66-3	ND	5.0
Chloromethane	74-87-3	ND	10
Dibromochloromethane	124-48-1	ND	5.0
Dibromomethane	74-95-3	ND	5.0
1,2-Dichlorobenzene	95-50-1	ND	5.0
1,3-Dichlorobenzene	541-73-1	ND	5.0
1,4-Dichlorobenzene	106-46-7	ND	5.0
Dichlorodifluoromethane	75-71-8	ND	10
1,1-Dichloroethane	75-34-3	ND	5.0
1,2-Dichloroethane	107-06-2	ND	5.0
1,1-Dichloroethene	75-35-4	ND	5.0
1,2-Dichloroethene, total	540-59-0	ND	5.0
1,2-Dichloropropane	78-87-5	ND	5.0
cis-1,3-Dichloropropene	10061-01-5	ND	5.0
trans-1,3-Dichloropropene	10061-02-6	ND	5.0
Ethylbenzene	100-41-4	ND	5.0
2-Hexanone	591-78-6	ND	50
Methylene chloride	75-09-2	ND	5.0
4-Methyl-2-pentanone	108-10-1	ND	50
Styrene	100-42-5	ND	5.0
1,1,2,2-Tetrachloroethane	79-34-5	ND	5.0
Tetrachloroethene	127-18-4	ND	5.0
Toluene	108-88-3	ND	5.0

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

METHOD BLANK(cont.)

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
1,1,1-Trichloroethane	71-55-6	ND	5.0
1,1,2-Trichloroethane	79-00-5	ND	5.0
Trichloroethene	79-01-6	ND	5.0
Trichlorofluoromethane	75-69-4	ND	5.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	5.0
Vinyl acetate	108-05-4	ND	50
Vinyl chloride	75-01-4	ND	10
Xylenes, total	1330-20-7	ND	10

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MS SURROGATE

Analyte	CAS No.	MS Surr. Conc. (ug/kg)	MS Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	25000	101
Toluene-d8	N/A	25000	98
p-Bromofluorobenzene	460-00-4	25000	93

MATRIX SPIKE

Analyte	CAS No.	MS Conc. (ug/kg)	MS Recovery (percent)
1,1-Dichloroethene	75-35-4	12500	120
Benzene	71-43-2	12500	106
Chlorobenzene	108-90-7	12500	92
Toluene	108-88-3	12500	94
Trichloroethene	79-01-6	12500	HC

HC = Recovery data is outside standard QC limits due to the high concentration of this analyte in the sample. LCS recovery data validates methodology.

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MSD SURROGATE

Analyte	CAS No.	Surr. Conc. (ug/kg)	MSD Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	25000	98
Toluene-d8	N/A	25000	97
p-Bromofluorobenzene	460-00-4	25000	92

MATRIX SPIKE DUPLICATE

Analyte	CAS No.	MSD Conc. (ug/kg)	MSD Recovery (percent)
1,1-Dichloroethene	75-35-4	12500	117
Benzene	71-43-2	12500	101
Chlorobenzene	108-90-7	12500	93
Toluene	108-88-3	12500	87
Trichloroethene	79-01-6	12500	HC

HC = Recovery data is outside standard QC limits due to the high concentration of this analyte in the sample. LCS recovery data validates methodology.

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RELATIVE % DIFFERENCE

Analyte	CAS No.	Relative Percent Difference (percent)
1,1-Dichloroethene	75-35-4	3
Benzene	71-43-2	5
Chlorobenzene	108-90-7	1
Toluene	108-88-3	8
Trichloroethene	79-01-6	10

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

LCS SURROGATE

Analyte	CAS No.	LCS Conc. (ug/kg)	LCS Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	99
Toluene-d8	N/A	100	95
p-Bromofluorobenzene	460-00-4	100	96

LAB CONTROL SAMPLE

Analyte	CAS No.	LCS Conc. (ug/kg)	LCS Recovery (percent)
1,1-Dichloroethene	75-35-4	50.0	128
Benzene	71-43-2	50.0	106
Chlorobenzene	108-90-7	50.0	95
Toluene	108-88-3	50.0	100
Trichloroethene	79-01-6	50.0	93

LCS DUPLICATE SURROGATE

Analyte	CAS No.	LCSD Conc. (ug/kg)	LCSD Surrogate Recovery (percent)

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

LCS DUPLICATE SURROGATE(cont.)

Analyte	CAS No.	LCSD Conc. (ug/kg)	LCSD Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	101
Toluene-d8	N/A	100	96
p-Bromofluorobenzene	460-00-4	100	99

LAB CONTROL SAMPLE DUPLICATE

Analyte	CAS No.	LCS Conc. (ug/kg)	LCSD Recovery (percent)
1,1-Dichloroethene	75-35-4	50.0	111
Benzene	71-43-2	50.0	104
Chlorobenzene	108-90-7	50.0	97
Toluene	108-88-3	50.0	96
Trichloroethene	79-01-6	50.0	90

LCS RPD

Analyte	CAS No.	LCS Relative Percent Difference (percent)

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

LCS RPD(cont.)

Analyte	CAS No.	LCS Relative Percent Difference (percent)
1,1-Dichloroethene	75-35-4	14
Benzene	71-43-2	2
Chlorobenzene	108-90-7	2
Toluene	108-88-3	4
Trichloroethene	79-01-6	3

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/10/97
Date Analyzed: 12/10/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21147
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MATRIX SPIKE DUPLICATE

Analyte	CAS No.	MSD Conc. (ug/kg)	MSD Recovery (percent)
1,1-Dichloroethene	75-35-4	12500	117
Benzene	71-43-2	12500	101
Chlorobenzene	108-90-7	12500	93
Toluene	108-88-3	12500	87
Trichloroethene	79-01-6	12500	HC

HC = Recovery data is outside standard QC limits due to the high concentration of this analyte in the sample. LCS recovery data validates methodology.

Analysis Report: pH, EPA Method 9040

Client:	Harding Lawson Associates 10324 Placer Lane Sacramento, CA 95827	Project No.:	37478 35
		Contact:	Mike Sides
		Phone:	(916)364-0793
Project:	McClellan FBAS	Lab Contact:	George Hampton
		Lab ID No.:	P0788
Date Sampled:	12/03/97	Job No.:	810788
Date Received:	12/03/97	COC Log No.:	NO NUMBER
Date Extracted:	N/A	Batch No.:	W971204C
Date Analyzed:	12/04/97	Instrument ID:	PH002
Date Reported:	06/19/98	Analyst ID:	PONGC
		Matrix:	OIL

ANALYTICAL RESULTS

Lab / Client ID Analyte	CAS No.	Value (Standard Units)
5A / PCOND-102 pH	N/A	6.48

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client:	Harding Lawson Associates 10324 Placer Lane Sacramento, CA 95827	Project No.:	37478 35
		Contact:	Mike Sides
		Phone:	(916)364-0793
Project:	McClellan FBAS	Lab Contact:	George Hampton
		Lab ID No.:	P0788-4A
Date Sampled:	12/03/97	Job No.:	810788
Date Received:	12/03/97	COC Log No.:	NO NUMBER
Date Extracted:	12/05/97	Batch No.:	51119
Date Analyzed:	12/09/97	Instrument ID:	PGC06
Date Reported:	06/19/98	Analyst ID:	SEPIDEHS
Client ID No.:	PCOND-101	Matrix:	OIL

PCOND-101

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Diesel	N/A	ND	5000
TPH as Motor Oil	N/A	ND	5000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client:	Harding Lawson Associates 10324 Placer Lane Sacramento, CA 95827	Project No.:	37478 35
		Contact:	Mike Sides
		Phone:	(916)364-0793
Project:	McClellan FBAS	Lab Contact:	George Hampton
		Lab ID No.:	P0788-5A
Date Sampled:	12/03/97	Job No.:	810788
Date Received:	12/03/97	COC Log No.:	NO NUMBER
Date Extracted:	12/05/97	Batch No.:	51119
Date Analyzed:	12/09/97	Instrument ID:	PGC06
Date Reported:	06/19/98	Analyst ID:	SEPIDEHS
Client ID No.:	PCOND-102	Matrix:	OIL

PCOND-102

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Diesel	N/A	ND	5000
TPH as Motor Oil	N/A	ND	5000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Sonication, EPA Method 3550

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/05/97
Date Analyzed: 12/09/97
Date Reported: 06/19/98

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 51119
Instrument ID: PGC06
Analyst ID: SEPIDEHS
Matrix: OIL

METHOD BLANK

Analyte	CAS No.	Results (mg/kg)	Reporting Limit (mg/kg)
TPH as Diesel	N/A	ND	1.0
TPH as Motor Oil	N/A	ND	1.0

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/04/97
Date Analyzed: 12/04/97
Date Reported: 06/19/98
Client ID No.: ADSORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-1A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21114
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	151 MA

ADSORB-101

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Gasoline	N/A	730	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/04/97
Date Analyzed: 12/04/97
Date Reported: 06/19/98
Client ID No.: ADSORB-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-2A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21114
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	200	200 MA

ADSORB-102

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Gasoline	N/A	10000	2000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/04/97
Date Analyzed: 12/04/97
Date Reported: 06/19/98
Client ID No.: DESORB-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-3A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21114
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	168 MA

DESORB-101

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Gasoline	N/A	790	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/04/97
Date Analyzed: 12/04/97
Date Reported: 06/19/98
Client ID No.: PCOND-101

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-4A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21114
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: OIL

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	20.0	127 MA

PCOND-101

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Gasoline	N/A	1400	200

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/03/97
Date Received: 12/03/97
Date Extracted: 12/04/97
Date Analyzed: 12/04/97
Date Reported: 06/19/98
Client ID No.: PCOND-102

Project No.: 37478 35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0788-5A
Job No.: 810788
COC Log No.: NO NUMBER
Batch No.: 21114
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: OIL

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	10000	190 MA

PCOND-102

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)
TPH as Gasoline	N/A	270000	100000

MA = Recovery data is outside standard QC limits due to matrix interference. LCS recovery data validates methodology.

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

ANALYSIS REPORT: **Tentatively Identified Compounds** **EPA METHOD: 8240**

CLIENT: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

PROJECT NO.:
CONTACT: **Mike Sides**
PHONE: **(916)364-0793**

PROJECT: **McClellan**

CLS CONTACT: **George Hampton**
JOB NO.: **810788**

DATE RECEIVED: **12/3/97**
DATE ANALYZED: **12/10/97**

COC LOG NO.:
CLS ID NO.: **P0788-1A**
BATCH NO.: **21147**

CLIENT ID: **ADSORB-101**
MATRIX: **Solid**

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (mg/Kg)
10.88	Butane, 2,2,3,3-tetramethyl-	82
12.70	Undecane, 2,5-dimethyl-	80
13.76	Pentane, 2,3,4-trimethyl-	110
14.06	Hexane, 2,3-dimethyl-	120
14.68	Hexane, 2,2,5-trimethyl-	180
16.06	Hexane, 2,3,5-trimethyl-	120
16.47	Unknown hydrocarbon	28
16.79	Heptane, 2,5-dimethyl-	89
18.01	Unknown hydrocarbon	100
18.31	Unknown hydrocarbon	120
18.79	Unknown hydrocarbon	79
19.25	Octane, 2,3-dimethyl-	230
20.33	Undecane, 2,9-dimethyl-	260
20.7	Decane, 2,2,9-trimethyl-	92
21.53	Heptane, 2,2,4,6,6-pentamethyl-	49
22.41	Unknown hydrocarbon	48

ANALYSIS REPORT: **Tentatively Identified Compounds** **EPA METHOD: 8240**

CLIENT: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

PROJECT NO.:
CONTACT: **Mike Sides**
PHONE: **(916)364-0793**

PROJECT: **McClellan**

CLS CONTACT: **George Hampton**
JOB NO.: **810788**

DATE RECEIVED: **12/3/97**
DATE ANALYZED: **12/10/97**

COC LOG NO.:
CLS ID NO.: **P0788-2A**
BATCH NO.: **21147**

CLIENT ID: **ADSORB-102**
MATRIX: **Solid**

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (mg/Kg)
10.93	Butane, 2,2,3,3-tetramethyl-	300
12.74	Undecane, 2,5-dimethyl-	390
13.78	Pentane, 2,3,4-trimethyl-	390
14.10	Pentane, 2,3,3-trimethyl-	550
14.7	Hexane, 2,2,5-trimethyl-	880
16.08	Hexane, 2,3,5-trimethyl-	250
16.79	Hexane, 4-ethyl-2-methyl-	100
18.08	Hexane, 2,2,5,5-tetramethyl-	210
18.33	Unknown hydrocarbon	490
18.79	Heptane, 3,3,5-trimethyl-	260
19.28	Heptane, 3-ethyl-	120
20.33	Unknown hydrocarbon	540
20.72	Unknown hydrocarbon	140

ANALYSIS REPORT: **Tentatively Identified Compounds** **EPA METHOD: 8240**

CLIENT: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

PROJECT NO.:
CONTACT: **Mike Sides**
PHONE: **(916)364-0793**

PROJECT: **McClellan**

CLS CONTACT: **George Hampton**
JOB NO.: **810788**

DATE RECEIVED: **12/3/97**
DATE ANALYZED: **12/10/97**

COC LOG NO.:
CLS ID NO.: **P0788-3A**
BATCH NO.: **21147**

CLIENT ID: **DESORB-101**
MATRIX: **Solid**

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (mg/Kg)
10.88	Hexane, 2,2-dimethyl-	77
12.72	Undecane, 2,5-dimethyl-	240
13.76	Pentane, 2,3,4-trimethyl-	180
14.06	Pentane, 2,3,3-trimethyl-	160
14.68	Hexane, 2,2,5,5-tetramethyl-	250
16.06	Hexane, 2,3,5-trimethyl-	150
16.45	Unknown hydrocarbon	30
16.77	Heptane, 3,5-dimethyl-	85
17.57	Unknown hydrocarbon	100
17.99	Unknown hydrocarbon	120
18.31	Unknown hydrocarbon	130
18.77	Heptane, 3,3,5-trimethyl-	81
19.25	Octane, 2,3-dimethyl-	220
20.31	Unknown hydrocarbon	250
20.68	Unknown hydrocarbon	80
21.53	Heptane, 2,2,4,6,6-pentamethyl-	44
22.41	Unknown hydrocarbon	40

ANALYSIS REPORT: **Tentatively Identified Compounds** **EPA METHOD: 8240**

CLIENT: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

PROJECT NO.:
CONTACT: **Mike Sides**
PHONE: **(916)364-0793**

PROJECT: **McClellan**

CLS CONTACT: **George Hampton**
JOB NO.: **810788**

DATE RECEIVED: **12/3/97**
DATE ANALYZED: **12/10/97**

COC LOG NO.:
CLS ID NO.: **P0788-4A**
BATCH NO.: **21147**

CLIENT ID: **PCOND-101**
MATRIX: **Oil**

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (mg/Kg)
10.86	Butane, 2,2,3,3-tetramethyl-	920
12.73	Undecane, 2,5-dimethyl-	2,200
13.74	Pentane, 2,3,4-trimethyl-	2,200
14.04	Hexane, 2,3-dimethyl-	2,600
14.63	Hexane, 2,2,5-trimethyl-	4,500
16.01	Heptane, 2,3-dimethyl-	1,900
16.73	Heptane, 3,5-dimethyl-	280
18.04	Unknown hydrocarbon	1,400
18.29	Unknown hydrocarbon	4,100
18.75	Unknown hydrocarbon	2,200
20.29	Heptane, 2,2,3,4,6,6-hexamethyl-	3,900
20.68	Unknown hydrocarbon	600
21.99	Unknown hydrocarbon	300

ANALYSIS REPORT: **Tentatively Identified Compounds** **EPA METHOD: 8240**

CLIENT: **Harding Lawson Associates**
10324 Placer Lane
Sacramento, CA 95827

PROJECT NO.:
CONTACT: **Mike Sides**
PHONE: **(916)364-0793**

PROJECT: **McClellan**

CLS CONTACT: **George Hampton**
JOB NO.: **810788**

DATE RECEIVED: **12/3/97**
DATE ANALYZED: **12/10/97**

COC LOG NO.:
CLS ID NO.: **P0788-5A**
BATCH NO.: **21147**

CLIENT ID: **PCOND-102**
MATRIX: **Oil**

RETENTION TIME (mins)	TENTATIVE IDENTIFICATION	ESTIMATED CONC (mg/Kg)
10.91	Butane, 2,2,3,3-tetramethyl-	9,900
12.77	Undecane, 2,5-dimethyl-	29,000
13.78	Pentane, 2,3,4-trimethyl-	27,000
14.10	Hexane, 2,3-dimethyl-	34,000
14.7	Hexane, 2,2,5-trimethyl-	57,000
16.08	Hexane, 2,3,5-trimethyl-	250,000
16.82	Octane, 3-methyl-	6,200
17.55	Cyclohexane, 1,1,3-trimethyl-	14,000
18.08	Heptane, 2,2,3,4,6,6-hexamethyl-	18,000
18.33	Unknown hydrocarbon	43,000
18.82	Heptane, 3,3,5-trimethyl-	24,000
19.28	Octane, 2,5-dimethyl-	5,900
20.34	Unknown hydrocarbon	34,000
20.73	Pentane, 2,2,3,4-tetramethyl-	5,100

CLS Labs

Environmental
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This report was sent automatically. In the event of an incomplete transmittance, 5 attempts will be made to send the complete number of pages for this report. If you have any questions, please call (916)638-7301 for assistance.

To: **Alfonso Ang** Date:6-19-98

From: CLS Labs Page 001 of 017

********** This report is also available via E-MAIL. **********
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* via e-mail directly to your desk. You may also request that *
* you would like both fax and e-mail reports be sent. For more *
* information, send an e-mail request to addme@clselis.com. *
****

The following facsimile report is of a final nature in fax format and as such does not include data that will be forthcoming in the complete report package. Interpretation of the report results should be made only after the complete report package has been delivered.

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/13/97
Date Received: 12/15/97
Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98
Client ID No.: ADSORB-103

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969-1A
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	250000	96
Toluene-d8	N/A	250000	99
p-Bromofluorobenzene	460-00-4	250000	100

ADSORB-103

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Acetone 67-64-1	ND	250000	2500
Benzene 71-43-2	ND	12000	2500
Bromodichloromethane 75-27-4	ND	12000	2500
Bromoform 75-25-2	ND	12000	2500
Bromomethane 74-83-9	ND	25000	2500
2-Butanone 78-93-3	ND	250000	2500
Carbon disulfide 75-15-0	ND	12000	2500

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/13/97
Date Received: 12/15/97
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Date Analyzed: 12/23/97
Date Reported: 06/19/98
Client ID No.: ADSORB-103

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969-1A
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-103(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Carbon tetrachloride 56-23-5	ND	12000	2500
Chlorobenzene 108-90-7	ND	12000	2500
Chloroethane 75-00-3	ND	25000	2500
2-Chloroethyl vinyl ether 110-75-8	ND	120000	2500
Chloroform 67-66-3	ND	12000	2500
Chloromethane 74-87-3	ND	25000	2500
Dibromochloromethane 124-48-1	ND	12000	2500
Dibromomethane 74-95-3	ND	12000	2500
1,2-Dichlorobenzene 95-50-1	ND	12000	2500
1,3-Dichlorobenzene 541-73-1	ND	12000	2500
1,4-Dichlorobenzene 106-46-7	ND	12000	2500
Dichlorodifluoromethane 75-71-8	ND	25000	2500
1,1-Dichloroethane 75-34-3	ND	12000	2500

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/13/97
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Date Reported: 06/19/98
Client ID No.: ADSORB-103

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969-1A
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-103(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
1,2-Dichloroethane 107-06-2	ND	12000	2500
1,1-Dichloroethene 75-35-4	ND	12000	2500
1,2-Dichloroethene, total 540-59-0	ND	12000	2500
1,2-Dichloropropane 78-87-5	ND	12000	2500
cis-1,3-Dichloropropene 10061-01-5	ND	12000	2500
trans-1,3-Dichloropropene 10061-02-6	ND	12000	2500
Ethylbenzene 100-41-4	ND	12000	2500
2-Hexanone 591 78 6	ND	120000	2500
Methylene chloride 75-09-2	ND	25000	2500
4-Methyl-2-pentanone 108-10-1	ND	120000	2500
Styrene 100-42-5	ND	12000	2500
1,1,2,2-Tetrachloroethane 79-34-5	ND	12000	2500
Tetrachloroethene 127-18-4	13000	12000	2500

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/13/97
Date Received: 12/15/97
Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98
Client ID No.: ADSORB-103

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969-1A
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

ADSORB-103(cont.)

Analyte CAS No.	Results (ug/kg)	Rep. Limit (ug/kg)	Dilution (factor)
Toluene 108-88-3	ND	12000	2500
1,1,1-Trichloroethane 71-55-6	ND	12000	2500
1,1,2-Trichloroethane 79-00-5	ND	12000	2500
Trichloroethene 79-01-6	100000	12000	2500
Trichlorofluoromethane 75-69-4	ND	12000	2500
1,1,2-Trichloro-1,2,2-trifluoroethane 76-13-1	ND	12000	2500
Vinyl acetate 108-05-4	ND	120000	2500
Vinyl chloride 75-01-4	ND	25000	2500
Xylenes, total 1330-20-7	ND	25000	2500

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MB SURROGATE

Analyte	CAS No.	Surr Conc. (ug/kg)	MB Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	103
Toluene-d8	N/A	100	99
p-Bromofluorobenzene	460-00-4	100	95

METHOD BLANK

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
Acetone	67-64-1	ND	100
Benzene	71-43-2	ND	5.0
Bromodichloromethane	75-27-4	ND	5.0
Bromoform	75-25-2	ND	5.0
Bromomethane	74-83-9	ND	10
2-Butanone	78-93-3	ND	100
Carbon disulfide	75-15-0	ND	5.0
Carbon tetrachloride	56-23-5	ND	5.0
Chlorobenzene	108-90-7	ND	5.0
Chloroethane	75-00-3	ND	10
2-Chloroethyl vinyl ether	110-75-8	ND	50

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

METHOD BLANK(cont.)

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
Chloroform	67-66-3	ND	5.0
Chloromethane	74-87-3	ND	10
Dibromochloromethane	124-48-1	ND	5.0
Dibromomethane	74-95-3	ND	5.0
1,2-Dichlorobenzene	95-50-1	ND	5.0
1,3-Dichlorobenzene	541-73-1	ND	5.0
1,4-Dichlorobenzene	106-46-7	ND	5.0
Dichlorodifluoromethane	75-71-8	ND	10
1,1-Dichloroethane	75-34-3	ND	5.0
1,2-Dichloroethane	107-06-2	ND	5.0
1,1-Dichloroethene	75-35-4	ND	5.0
1,2-Dichloroethene, total	540-59-0	ND	5.0
1,2-Dichloropropane	78-87-5	ND	5.0
cis-1,3-Dichloropropene	10061-01-5	ND	5.0
trans-1,3-Dichloropropene	10061-02-6	ND	5.0
Ethylbenzene	100-41-4	ND	5.0
2-Hexanone	591-78-6	ND	50
Methylene chloride	75-09-2	ND	10
4-Methyl-2-pentanone	108-10-1	ND	50
Styrene	100-42-5	ND	5.0
1,1,2,2-Tetrachloroethane	79-34-5	ND	5.0
Tetrachloroethene	127-18-4	ND	5.0
Toluene	108-88-3	ND	5.0

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

METHOD BLANK(cont.)

Analyte	CAS No.	Results (ug/kg)	Reporting Limit (ug/kg)
1,1,1-Trichloroethane	71-55-6	ND	5.0
1,1,2-Trichloroethane	79-00-5	ND	5.0
Trichloroethene	79-01-6	ND	5.0
Trichlorofluoromethane	75-69-4	ND	5.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	5.0
Vinyl acetate	108-05-4	ND	50
Vinyl chloride	75-01-4	ND	10
Xylenes, total	1330-20-7	ND	10

ND = Not detected at or above indicated Reporting Limit

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MS SURROGATE

Analyte	CAS No.	MS Surr. Conc. (ug/kg)	MS Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	105
Toluene-d8	N/A	100	96
p-Bromofluorobenzene	460-00-4	100	100

MATRIX SPIKE

Analyte	CAS No.	MS Conc. (ug/kg)	MS Recovery (percent)
Benzene	71-43-2	50.0	106
Chlorobenzene	108-90-7	50.0	94
1,1-Dichloroethene	75-35-4	50.0	112
Toluene	108-88-3	50.0	98
Trichloroethene	79-01-6	50.0	95

MSD SURROGATE

Analyte	CAS No.	Surr. Conc. (ug/kg)	MSD Surrogate Recovery (percent)

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

MSD SURROGATE(cont.)

Analyte	CAS No.	Surr. Conc. (ug/kg)	MSD Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	107
Toluene-d8	N/A	100	92
p-Bromofluorobenzene	460-00-4	100	95

MATRIX SPIKE DUPLICATE

Analyte	CAS No.	MSD Conc. (ug/kg)	MSD Recovery (percent)
Benzene	71-43-2	50.0	104
Chlorobenzene	108-90-7	50.0	92
1,1-Dichloroethene	75-35-4	50.0	107
Toluene	108-88-3	50.0	91
Trichloroethene	79-01-6	50.0	75

RELATIVE % DIFFERENCE

Analyte	CAS No.	Relative Percent Difference (percent)

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
CNC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

RELATIVE % DIFFERENCE(cont.)

Analyte	CAS No.	Relative Percent Difference (percent)
Benzene	71-43-2	2
Chlorobenzene	108-90-7	2
1,1-Dichloroethene	75-35-4	5
Toluene	108-88-3	7
Trichloroethene	79-01-6	24

Analysis Report: Volatile Organic Compounds by GC/MS, EPA Method 8240

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/23/97
Date Analyzed: 12/23/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21275
Instrument ID: MS02
Analyst ID: MARKW
Matrix: SOLID

LCS SURROGATE

Analyte	CAS No.	LCS Conc. (ug/kg)	LCS Surrogate Recovery (percent)
1,2-Dichloroethane-d4	N/A	100	98
Toluene-d8	N/A	100	95
p-Bromofluorobenzene	460-00-4	100	97

LAB CONTROL SAMPLE

Analyte	CAS No.	LCS Conc. (ug/kg)	LCS Recovery (percent)
Benzene	71-43-2	50.0	103
Chlorobenzene	108-90-7	50.0	96
1,1-Dichloroethene	75-35-4	50.0	116
Toluene	108-88-3	50.0	97
Trichloroethene	79-01-6	50.0	90

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Sampled: 12/13/97
Date Received: 12/15/97
Date Extracted: 12/19/97
Date Analyzed: 12/21/97
Date Reported: 06/19/98
Client ID No.: ADSORB-103

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969-1A
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21254
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	200	92

ADSORB-103

Analyte	CAS No.	Results (mg/kg)	Rep. Limit (mg/kg)	Dilution (factor)
TPH as Gasoline	N/A	2200	2000	2000

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/19/97
Date Analyzed: 12/21/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21254
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

MB SURROGATE

Analyte	CAS No.	Surr Conc. (mg/kg)	MB Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	0.100	101

METHOD BLANK

Analyte	CAS No.	Results (mg/kg)	Reporting Limit (mg/kg)
TPH as Gasoline	N/A	ND	1.0

ND = Not detected at or above indicated Reporting Limit

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/19/97
Date Analyzed: 12/21/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21254
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

MS SURROGATE

Analyte	CAS No.	MS Surr. Conc. (mg/kg)	MS Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	0.100	108

MATRIX SPIKE

Analyte	CAS No.	MS Conc. (mg/kg)	MS Recovery (percent)
Gasoline	N/A	2.50	92

MSD SURROGATE

Analyte	CAS No.	Surr. Conc. (mg/kg)	MSD Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	0.100	121

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/19/97
Date Analyzed: 12/21/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21254
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

MATRIX SPIKE DUPLICATE

Analyte	CAS No.	MSD Conc. (mg/kg)	MSD Recovery (percent)
Gasoline	N/A	2.50	107

RELATIVE % DIFFERENCE

Analyte	CAS No.	Relative Percent Difference (percent)
Gasoline	N/A	15

CA DOHS ELAP Accreditation/Registration Number 1233

Analysis Report: Total Petroleum Hydrocarbons, EPA Method 8015
Purge and Trap, EPA Method 5030

Client: Harding Lawson Associates
10324 Placer Lane
Sacramento, CA 95827

Project: McClellan FBAS

Date Extracted: 12/19/97
Date Analyzed: 12/21/97
Date Reported: 06/19/98

Project No.: 37478.35
Contact: Mike Sides
Phone: (916)364-0793

Lab Contact: George Hampton
Lab ID No.: P0969
Job No.: 810969
COC Log No.: NO NUMBER
Batch No.: 21254
Instrument ID: GC018
Analyst ID: JENNDC
Matrix: SOLID

LCS SURROGATE

Analyte	CAS No.	LCS Conc. (mg/kg)	LCS Surrogate Recovery (percent)
o-Chlorotoluene	95-49-8	0.100	125

LAB CONTROL SAMPLE

Analyte	CAS No.	LCS Conc. (mg/kg)	LCS Recovery (percent)
Gasoline	N/A	2.50	109

CA DOHS ELAP Accreditation/Registration Number 1233

Harding Lawson Associates
10324 Placer Lane
Sacramento, California 95827
916/364-0789
Telecopy: 916/364-5833

CHAIN OF CUSTODY FORM P0961

Lab: CLS

Samplers: Dan Gwaltney

P.6 Job Number: 37478.35

Name/Location: McClellan FOAS

Project Manager: Mike Sides

Recorder: (Signature Required)

SOURCE CODE	MATRIX: Blood	Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
90	X					1			RESHP-104			97	12	13	1300	
									ADSORB-103							

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240 VOC's	EPA 625/8270	ICP METALS	EPA 8015M/TPH	EPA 5030/8015(mod)TPH
		X				X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	DATE/TIME
Dan Gwaltney	12-15-97 9:55		
RELINQUISHED BY: (Signature)		RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)		RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)		RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME 12-15-97 9:55
METHOD OF SHIPMENT			

FEB 23 '98 08:52PM HLA * OAKLAND

Laboratory Copy White | Project Office Copy Yellow | Field or Office Copy Pink

6533

APPENDIX E

INORGANIC ANALYSES LABORATORY REPORT

Robertson Microlit Laboratories, Inc.

P.O. Box 927 / 29 Samson Ave. / Madison, N.J. 07940 / (201) 966-6668 / Fax (201) 966-0136

MR MIKE SIDES
HARDING LAWSON ASSOCIATES
383 FOURTH STREET 3RD FL
OAKLAND, CA 94607

HARDING ASSOC
SEP 0 8 1997

001
HLA001

A N A L Y T I C A L R E P O R T

09/05/1997

PAGE 1

SAMPLE NO: ABSORB-01 TEST: 1 RECEIVED: 09/03/1997 COMPLETED: 09/05/1997

Results: C=83.19 H=3.36 N=<0.02 S=8.64 O=2.54 Fe=0.135 ICP=1 RESFX=1

END OF REPORT

APPENDIX F

FIELD DEMONSTRATIONS TERMINATION PROPOSAL

Harding Lawson Associates

October 17, 1997

37478 99

Mr. Larry Jaramillo
PKOP
5120 Dudley Blvd.
McClellan Air Force Base, California 95652

Field Demonstration Termination Proposal
PRDA Fluidized Resin Adsorption Test
Contract Number: FO4699-95-R-0143

Dear Mr. Jaramillo:

With this letter, Harding Lawson Associates (HLA) proposes procedures to terminate a field demonstration at McClellan Air Force Base (McClellan AFB) under our Program Research and Development Announcement (PRDA) Contract. Our proposed field operation shut-down protocol, final report content, and cost impacts are discussed below; the recommended Performance Work Statement modifications to implement these close-out procedures are attached.

Field data collected from the Fluidized Bed Adsorption (FBA) system between July and September 1997 indicate that resin characteristics were altered by the mixed waste stream being processed at test site IC-31. Increased resin adhesion has prevented the FBA system from operating properly and necessitated deviations from HLA's Work Implementation Plan (WIP). However, the data generated will provide McClellan AFB with valuable information regarding the performance of synthetic resins which are commonly used as adsorptive media for many remediation technologies, including one that is scheduled for future testing at IC-31.

We are proposing to complete the testing and evaluate the results relative to the relevant original objectives presented in the WIP and assess how system performance was impacted by the mix of constituents found at IC-31.

FIELD OPERATION TERMINATION PROTOCOL

HLA proposes to implement a modified monitoring program to complete data collection to assess the effect on resin performance by influent vapors containing chlorinated volatile organic compounds (VOCs) mixed with branched-alkanes. The close-out monitoring program is designed to assess short-term accumulation of VOCs on the resin during sequential circulations through the FBA system and is consistent with the test method suggested by McClellan AFB in your September 30 electronic correspondence.

Task 1 - Initial Desorption

Operate the FBA system using ambient influent air to remove VOCs from the resin to the greatest extent possible. The existing load of resin will be circulated through the FBA system for a minimum of 6, and up to 24 hours (minimum of 3, and up to 12 bead circulation cycles) to provide sufficient residence time in the desorber to remove as much chemical mass as possible under current conditions. Because no source of VOCs will be connected, VOCs will not be accumulating on the resin in the adsorber during this exercise. HLA will collect resin samples from the adsorber to estimate baseline VOC loading on the resin after performing this desorption process.

Task 2 - Monitor VOC Accumulation

Introduce soil vapors into the influent and monitor resin loading as the beads circulate through the FBA to observe how constituents accumulate on the resin. Influent and effluent air samples for field or laboratory analyses will be collected upon startup and once every hour of operation in accordance with the sampling schedule, Table 1. Air samples will continue to be collected for up to 8 hours or until the system shuts down, at which time resin samples will be collected from the adsorber and desorber. HLA will evaluate those data relative to manufacturer expected performance specifications to assess how the chemical and physical properties of the resin vary during treatment operations.

Task 3 - Final Desorption

Repeat the desorption process by operating the FBA system using ambient influent air to remove VOCs from the resin to the greatest extent possible for disposal purposes. The resin will be circulated through the FBA system for a minimum of 6, and up to 24 hours (minimum of 3, and up to 12 bead circulation cycles) to remove as much chemical mass as possible. HLA will collect resin samples from the adsorber and characterize the resin for disposal purposes.

CLOSE-OUT REPORT CONTENT

HLA will prepare a close-out report in accordance with the example format provided by McClellan AFB. The FBA system will be evaluated relative to the relevant original objectives stated in the WIP. Since continuous FBA operation was not sustainable during the field demonstration, our evaluation will focus on how resin performance was affected by the IC-31 mixed waste stream. We will assess how the resin performance varied from the FBA operation requirements and resin specifications provided by the manufacturer, Rohm and Haas Company. The conclusions will summarize our findings from many weeks of trouble-shooting; our recommendations will address how the system design and operation could be adjusted to compensate for the performance variances observed at the site.

COST IMPACT

HLA recognizes that the operational phase of the PRDA was not performed as described in the WIP; however, HLA implemented an extensive unanticipated effort to diagnose, modify, and attempt operation of the FBA system after equipment startup in mid-July. HLA conducted troubleshooting activities to identify and respond to unexpected conditions at IC-31 that adversely impacted FBA performance, apparently caused by the presence of a mixed waste stream with relatively high concentrations of branched-alkane compounds. We believe the findings from our response to this situation will be useful to McClellan AFB for further defining the applicability of FBA with synthetic resins and its apparent incompatibility with mixed waste-stream sites. The following paragraphs describe the activities performed to date that were not anticipated in our original proposal as well as other factors that impact the final contract amount.

Our trouble-shooting strategy focused on identifying and eliminating possible causes for the loss of bead flow within the FBA, resulting in system shut downs. We worked with Rohm and Hass Company, the resin manufacturer, to systematically eliminate possible causes, including:

- Mechanical restrictions
- Air/bead flow dynamics within the adsorber
- High relative humidity in the influent air stream
- Transformation of resin physical/chemical characteristics
- Purge gas flow rate in desorber, and
- Desorption temperature.

Troubleshooting activities included providing field staff for 18 one-half to full day site visits with extensive technical support in the office. This effort is approximately equivalent to the effort we had anticipated for 9 weeks of system operation. The most substantial portion of our troubleshooting was focused on eliminating excessive water condensation, initially considered a likely cause for the beads to loosely bond and inhibit their cycling through the system. We made adjustments to the after-cooler (which cools air leaving the blower), installed another air/water separator, and replaced valves that control the flow of beads. In addition, McClellan AFB allowed HLA to isolate flow from VW-1005 to make sure that air-stripper off-gas (heavily saturated with water) was not contributing condensate to the influent air stream. Relative humidity measurements were collected to allow the process configuration to be adjusted to reduce moisture. After system adjustment, HLA observed inconsistent bead flow with relative humidity of the inlet stream below 90 percent. Rohm and Haas indicated that Ambersorb 600 should not exhibit cohesion due to moisture accumulation under these conditions.

After HLA conducted startup sampling in accordance with the WIP, HLA collected resin and air samples from the FBA system to analyze the situation from a chemical perspective. We summarized the chemical analyses results in a facsimile and electronic transmittals to McClellan AFB and discussed the

situation with Rohm and Haas technical support personnel. We implemented Rohm and Haas recommendations to increase the flow of nitrogen purge gas used to flush VOCs from the desorption chamber and increased the desorption temperature, but the bead flow continued to be inconsistent. We also followed another Rohm and Haas recommendation and submitted a resin sample to a specialty laboratory for elemental analyses to evaluate whether an unexpected inorganic compound, such as rust, may be fouling the resin.

The final report will address the results of HLA's close-out monitoring plan, discussed above, in addition to addressing the objectives presented in our WIP; the report will include additional discussions regarding the complications that arose in the field. Although generating and presenting life cycle costs for system operation will not be warranted, the level of effort for reporting will likely be similar to what we anticipated in our PRDA response package to McClellan AFB as a result of diagnostic field data and their analyses.

On the basis of these factors, HLA proposes a reduction of $20,000 from the original PRDA contract amount of $232,438 to $212,438. (This amount excludes the optional $3,139 travel task.) This contract adjustment will reimburse McClellan for the portion of the operational period that was not performed or used to conduct troubleshooting activities.

We have attached recommended modifications to the Performance Work Statement (PWS) in order to contractually implement the close-out procedures described in this letter. We appreciate your consideration in this matter. HLA will wait for guidance from McClellan AFB before taking any further action.

Your very truly,

HARDING LAWSON ASSOCIATES

David P. Hochmuth
Project Manager

Christopher R. Smith
Program Manager

DPH/CRS/lm50224.doc-Mc

Attachments: Proposed Performance Work Statement Modifications
Table 1 - Field Closeout Sampling Schedule

cc: Mr. Tim Chapman, BDM
Mr. Craig Burnett, EMRP

PERFORMANCE WORK STATEMENT MODIFICATIONS

HLA proposes the following modifications to the Performance Work Statement (PWS) in order to contracturally implement the close-out of the field operations as discussed in this letter. The following modifications are recommended to PWS Section 3.0, titled "Tasks":

3.7 The contractor shall provide staff to operate and monitor the system performance during system startup, operation, and close-out periods. ~~for three months.~~

3.8 ...Field readings shall be measured with a gas chromatograph and photoionization detector (GC/PC); measurements shall be recorded every day during the first week an once per week thereafter during system operation and close-out periods. ~~This demonstration shall be subdivided into two treatment periods to demonstrate performance at both high and low influent concentrations. The system shall treat full strength concentrations for two months followed by one month of operation with diluted influent concentrations.~~

~~3.11 The contractor shall submit effluent air samples to a certified laboratory for analyses of NOx concentrations to verify that this compounds is not generated as byproducts from the fluidized bed treatment process.~~

~~3.14 The contractor shall estimate the cost for the full life cycle operation of the system based on costs obtained from the pilot test. the contractor shall estimate operation costs of comparable treatment eqipment operation under similar conditions.~~

Table 1. Field Closeout Sampling Schedule
PRDA Test "Fluidized Bed Adsorption"
McClellan Air Force Base, Site IC-31
Sacramento, California

Parameter	Method	Data Quality Level	Sample Location	CLOSE-OUT OPERATIONS										
				Hour 0	Hour 0.5	Hour 1	Hour 1.5	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8
VAPORS & EMISSIONS														
Flow	—	Screening	FBAI	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
Temperature and Pressure	—	Screening	FBAI	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
			FBAE	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
Total VOCs	PID	Screening	FBAI	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
			FBAE	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
Halogenated and Aromatic VOCs and NMOCs	EPA 8021 and E18 modified	Definitive	FBAI	1	—**	—**	—**	—**	—**	—**	—**	—**	—**	1**
			FBAE	1	—**	—**	—**	—**	—**	—**	—**	—**	—**	1**
			QC Samples	FD	—	—	—	—	—	—	—	—	—	—
Corrosive Gasses	CORROSOMETER®	Definitive	Stack	Continuous Monitoring										
WATER CONDENSATE														
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Condensate Storage Drum	—	—	—	—	—	—	—	—	—	—	1
TPH	EPA 3510/8015 mod	Definitive	Condensate Storage Drum	—	—	—	—	—	—	—	—	—	—	1
Acidity	EPA 9040	Definitive	Condensate Storage Drum	—	—	—	—	—	—	—	—	—	—	1
PRODUCT CONDENSATE														
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Condensate Storage Drum	—	—	—	—	—	—	—	—	—	—	1
TPH	EPA 3510/8015 mod	Definitive	Condensate Storage Drum	—	—	—	—	—	—	—	—	—	—	1
RESIN BEADS														
Halogenated and Aromatic VOCs	EPA 8240	Definitive	Adsorber	1	—	—	—	—	—	—	—	—	—	1
			Desorber	—	—	—	—	—	—	—	—	—	—	1
TPHp	EPA 5030/8015 mod	Definitive	Adsorber	1	—	—	—	—	—	—	—	—	—	1
			Desorber	—	—	—	—	—	—	—	—	—	—	1

* One sampling event may involve multiple measurements.

** Samples will be collected at each interval until the system shuts down due to bead flow problems; only the beginning and end-point samples of the close-out operation will be submited to the laboratory.

FBAE = Fluidized Bed Adsorption Effluent

FBAI = Fluidized Bed Adsorption Influent

FD = field duplicate

NMOCs = non-methane organic compounds

PID = photoionization device

QC = quality control

TICS = tentatively identified compounds

TPH = total petroleum hydrocarbons

TPHp = TPH using purgable recovery method

TVH = total volatile hydrocarbons

VOCs = volatile organic compounds

SOCs = semi-volatile organic compounds

APPENDIX G

DEMONSTRATION COST SUMMARY

APPENDIX G DEMONSTRATION COST SUMMARY

For the technology (T) in question, please provide a cost, as applicable, for each of the following elements. Additionally, provide a separate cost for the entire demonstration (D), as applicable, for each of the following elements. Attach supporting or backup information to this form.

a. Pre-treatment Requirements

(1) Work Plan Development
T:_____ D: $33,000

(2) Regulatory Approval
T:_____ D: $700

(3) Mobilization and Preparatory Work
T:_____ D: $ 1,200

(4) Monitoring, Testing, Sampling and Analysis
T:_____ D: $ 2,000

(5) Site Work (roads, utility distribution, demolition, clearing, grading, shoring, etc.)
T:_____ D: $ 0

(6) Surface Water Collection and Control (e.g. storm drainage)
T:_____ D: $ 0

(7) Groundwater Collection and Control (e.g. slurry walls)
T:_____ D: $ 0

(8) Air Pollution/Gas Collection and Control
T:_____ D: $ 0

(9) Solids Collection and Containment
T:_____ D: $ 0

(10) Liquids/Sediments/Sludges Collection and Containment
T:_____ D: $ 600

(11) Drums/Tanks/Structures/Miscellaneous Demolition/Removal
T:_____ D: $ 0

(12) Equipment Installation
T:_____ D: $ 4,500

(13) Other (Equipment transportation and coordination)
T:_____ D: $ 3,000

b. Treatment Costs

(1) Sampling and Analysis
T:_____ D: $16,000

(2) Materials (Raw Materials and Equipment)
T:_____ D: $68,000

(3) Fuel and Utilities (Water, Electricity, Gas, etc.)
T:_____ D: $ 6,800

(4) Operations and Maintenance
T:_____ D: $25,000

(5) Rental Equipment (Vehicles, Computers, etc.)
T:_____ D: $ 4,000

(6) Facilities (Trailers, Latrines, etc.)
T:_____ D: $ 800

(7) Decontamination
T:_____ D: $ 0

(8) Labor
T:_____ D: $20,000

(9) Other (Please Specify)
T:_____ D: $ 0

c. Post Treatment Requirements

(1) Decontamination and Decommissioning
T:_____ D:$ 2,100

(2) Disposal (Please state commercial or other than commercial)
T:_____ D:$ 1,000

(3) Site Restoration (e.g. topsoil, landscaping, restoration of roads, etc.)
T:_____ D:$ 0

(4) Demobilization
T:_____ D:$ 500

(5) Administrative Data Collection and Reporting
T:_____ D:$23,000

(6) Other (Please Specify)
T:_____ D:$ 0

DISTRIBUTION

Technology Analysis Report
PRDA Test: Fluidized Bed Adsorption
McClellan Air Force Base, Site IC 31
Sacramento, California

June 19, 1998

Copy No. ___

Copies 1 - 45: Mr. Larry Jaramillo
PKOP
5120 Dudley Blvd.
McClellan Air Force Base, California 95652

Copies 46-50: Harding Lawson Associates

Quality Control Reviewer

Stephen J. Osborne, P.E.
Principal Engineer

DPH/MAS/mlw/036871R-H